DOCUMENT RESUME

ED 347 356 CE 061 598

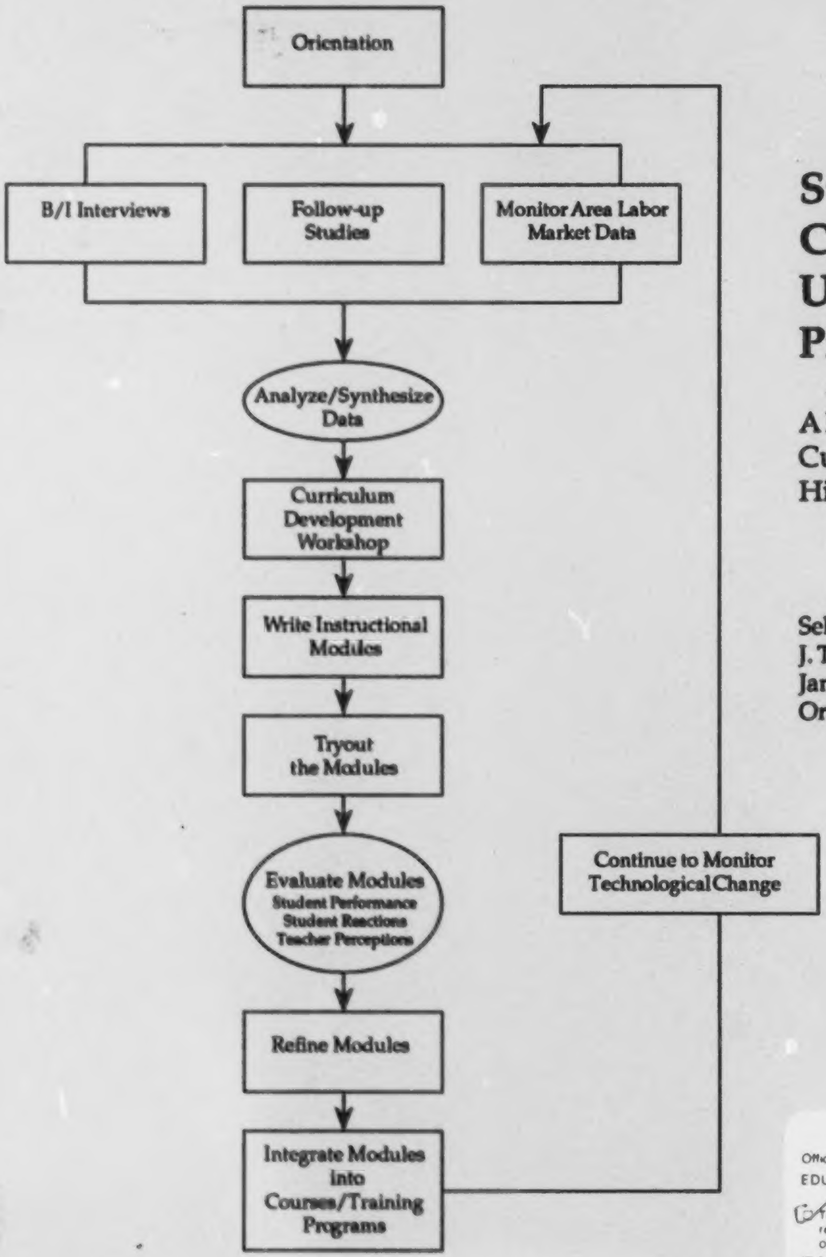
AUTHOR	Mero, J. Timothy, Ed.; And Others
TITLE	Strategic Curriculum Updating Process. A Modular Approach to Keeping Curriculums Current with Changing High-Technology Requirements.
INSTITUTION	Wisconsin Univ. - Stout, Menomonie. Center for Vocational, Technical and Adult Education.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE	90
CONTRACT	V199A90151
NOTE	438p.; Developed as part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges, and Local and State Educational Agencies.
PUB TYPE	Guides - Non-Classroom Use (055) -- Collected Works - General (020)
EDRS PRICE	MF01/PC18 Plus Postage.
DESCRIPTORS	Articulation (Education); *Curriculum Development; Educational Assessment; Educational Improvement; Educational Planning; Education Work Relationship; Followup Studies; *Instructional Materials; *Material Development; Needs Assessment; Postsecondary Education; Program Improvement; Research Methodology; *Rural Education; School Business Relationship; Secondary Education; Small Group Instruction; Surveys; *Technical Education; Technical Institutes; *Technological Advancement

ABSTRACT

This handbook describes the processes used in a project to identify technological changes taking place in business and industry and to infuse content related to these changes into the curricula of technical colleges and local education agencies in rural areas. The handbook includes 15 modules. The first module explains the system developed by the project, and the other modules present more specific processes. Topics covered are the following: high-technology curriculum updating processes; envisioning process; needs assessment; planning and conducting statewide or regional surveys and interview surveys of businesses and industries; planning and conducting follow-up studies; planning and conducting a Delphi study; selecting appropriate sampling techniques and determining valid sample sizes; working with small groups; necessary skills matrix; articulation--helping students transition from secondary to postsecondary institutions; module development guidelines; evaluation; work-based learning experiences; and developing partnerships between education and business and industry. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED347356


Orientation
B/I Interviews
Follow-up Studies
Monitor Area Labor Market Data
Analyze/Synthesize Data
Curriculum Development Workshop
Write Instructional Modules
Tryout the Modules
Evaluate Modules
Student Performance
Student Reactions
Teacher Perceptions
Refine Modules
Integrate Modules into Courses/Training Programs
Continue to Monitor Technological Change

Strategic Curriculum Updating Process

A Modular Approach to Keeping Curriculms Current With Changing High-Technology Requirements

Selected Modules Edited by:
J. Timothy Mero
James P. Breen
Orville Nelson

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it
☐ Minor changes have been made to improve reproduction quality
- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

CE061598

BEST COPY AVAILABLE

Strategic Curriculum Updating Process

A Modular Approach to Keeping Curriculums Current with Changing High-Technology Requirements

Developed as a part of the High-Technology
Training Model for Rural Based Business and
Industry, Technical Colleges and Local and State
Educational Agencies under Grant No. V199A90151.

The material herein was developed pursuant to Grant Number V199A90151 with Federal funding from the Office of Vocational and Adult Education, U.S. Department of Education. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Department of Education position or policy. UW-Stout does not discriminate on the basis of race, sex, religion, age, handicap or national origin.

Selected Modules Edited by:
J. Timothy Mero, James P. Breen, and Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

PREFACE

This handbook describes the processes project staff members and participating teachers used to identify technological changes taking place in business and industry and to infuse content related to these changes in their curriculums. The primary purposes of the High-Technology Training Model Project were to (1) develop a practical method to monitor technological changes in B/I and, (2) design a process to up-date vocational, technical, and technology education curriculums.

This handbook includes fifteen modules. Their topics range from articulation to working with small groups. Some focus on a specific process and others are more general. We recommend that you read the first module, "High-Technology Curriculum Up-Dating Processes," to gain an understanding of the system developed by the project. The other modules present more specific processes and can be read or used individually. Where there are ties to other modules, these are noted and the other module(s) is referenced.

The project officially ended on September 30, 1990. However, development of the system and processes described in this handbook continues. New opportunities to apply these modules continue to arise in our work. If you have questions or comments, please share them with us. We can be reached by phone at (715) 232-1382.

Orville Nelson

Tim Mero

CONTRIBUTORS

John F. Entorf, Ed. D. (Module 15), deceased; was a Professor and Dean, College of Technology, Boise State University, Boise, ID.

James P. Breen, B.S. (Modules 4,9,10,13) is a Training Development Instructor, and Master of Science Candidate in Vocational Education, University of Wisconsin-Stout, Menomonie, WI.

Kathleen Hirsch, M.S. (Module 14) is Assistant Researcher, Secondary Vocational Education Evaluation Project; Center for Vocational Technical and Adult Education, University of Wisconsin-Stout, Menomonie, WI.

Howard D. Lee, Ph.D. (Module 12 and 14) is a Professor and Associate Dean, School of Industry and Technology, University of Wisconsin-Stout, Menomonie, WI.

J. Timothy Mero, M.S. (Modules 4,5,7,10,11,13, and 14) Cast Metal Technology Instructor and Education Specialist Candidate, University of Wisconsin-Stout, Menomonie, WI.; Doctoral Student in Vocational Eduction Department, University of Minnesota, Minneapolis, MN.

Orville Nelson, Ph.D. (Modules 1,2,3,4,6,7,8, and 13) is a Professor; Director, Center for vocational, Technical and Adult Education; and Associate Dean, School of Industry and Technology, University of Wisconsin-Stout, Menomonie, WI.

ACKNOWLEDGEMENT

We wish to express our sincere appreciation to Brenda Halvorson and Steve Schlough for their patience, dedication and assistance in the preparation of this handbook.

In addition appreciation is extended to the following district coordinators and educators who participated in this project from February 1, 1989 through September 30, 1990.

Cooperative Educational Service Area 9

Lakeland Union High School, Minocqua, WI

Fred Skebba, LVEC
Steve Prahl, Teacher
Ken Ondrus, Teacher
Tom Noel, Teacher

Merrill Senior High School, Merrill, WI

Greg Kautza, LVEC
Donald Viegut, LVEC
Thomas Andreska, Teacher
David Belfiori, Teacher
Louise Schotz, Teacher

Mosinee High School, Mosinee, WI

James DeBroux, Principle
James Martin, Teacher
E. Thom Rogers, Teacher
James Stocco, Teacher

Wausau Public School District, Wausau, WI

Gary Leonard, LVEC
Dennis Leonard, Teacher, Wausau East High School
Robert Zulegar, Teacher Wausau East High School

Cooperative Educational Service Area 10

Cadott High School, Cadott, WI

Gerald Munyon, LVEC (CESA 10)
Anson Albarado, Teacher
Thomas Kyser, Teacher

Eau Claire School District, Eau Claire, WI

Cliff Stanford, Director Special Services
Diane Ryberg, Teacher, Eau Claire North
Al Willet, Teacher

Cooperative Educational Service Area 11

Baldwin-Woodville Area, Baldwin, WI

Duane W. Lones, District Administrator
Hugh Lockerby, Teacher, Baldwin-Woodville High School
David North, Teacher, Baldwin-Woodville High School
Albert Vobejda, Teacher, Baldwin-Woodville High School

Grantsburg School District, Grantsburg, WI

Merlin A. Johnson, District Administrator
Dennis Allaman, Teacher, Grantsburg Junior High School
Steve Johnson, Teacher, Grantsburg Elementary School
Bonny Pederson, Teacher, Grantsburg Senior High School

Menomonie High School, Menomonie, WI

Herb Mehne, LVEC
Eugene Traxler, Teacher
Dale Dahlke, Teacher

Rice Lake High School

Robert Fisher, LVEC
Robert Biddick, Teacher
Joseph Huftel, Teacher
William Rademaker, Teacher

Chippewa Valley Technical College

Eau Claire Campus, Eau Claire, WI

Dean Tabor, Business Education Associate Supervisor
James Ahneman, Instructor
Candyce J. Lund, Instructor
Dennis Menk, Instructor

Northcentral Technical College

Wausau Campus, Wausau, WI

Therese Seaman, Curriculum Service Supervisor
Crystal Anderson, Instructor
Dan Lodahl, Instructor
James Tucker, Instructor

Wisconsin Indianhead Technical College

Shell Lake Headquarters

Lois L. Eichman, Administrator

New Richmond Campus, New Richmond, WI

Donald C. Lindemann, Instructor
Kevin Lipsky, Instructor

Rice Lake Campus, Rice Lake, WI

Roger Luthens, Instructor
Richard Thompson, Instructor

Finally, a appreciation to Dr. Ted Knous, Associate Dean for Research, Research Promotional Services, at UW-Stout.

CONTENTS

Preface ii

Contributors. iii

Acknowledgements. iv

Modules

1.
High-Technology Curriculum Updating Processes 1
Orville Nelson

2.
Envisioning Process 49
Orville Nelson

3.
Needs Assessment 78
Orville Nelson

4.
Planning and Conducting A Statewide or Regional Survey of Businesses and Industries 88
J. Timothy Mero, Orville Nelson, and James P. Breen

5.
Planning and Conducting an Interview Survey of Representatives of Businesses and Industries 124
J. Timothy Mero
6.
Planning and Conducting Follow-Up Studies. 165
Orville Nelson

7.
Planning and Conducting A Delphi Study 207
J. Timothy Mero and Orville Nelson

8.
Selecting Appropriate Sampling Techniques and Determining Valid Sample Sizes 255
Orville Nelson

9.
Working With Small Groups. 280
James P. Breen

10.
Necessary Skills Matrix. 292
James P. Breen and J. Timothy Mero

11.
Articulation: Helping Students Transition from Secondary to Postsecondary Institutions. 305
J. Timothy Mero

12.
Module Development Guidelines. 336
Howard D. Lee

13.
Evaluation 350
James P. Breen, Orville Nelson, and J. Timothy Mero

14.
Work Based Learning Experiences. 396
Kathleen Hirsch, Howard D. Lee, and J. Timothy Mero

15.
Developing Partnerships Between Education and Business/Industry 423
John F. Entorf

HIGH-TECHNOLOGY TRAINING
MODEL MODULE

High-Technology Curriculum
Updating Processes

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 3

Purpose 3

Objectives. 3

Applications of the Process 4

The Process 5

Appendices

A. Business/Industry Interview Questions 32

B. One and Five-Year Follow-Up Surveys 35

C. Employer One and Five-Year Follow-Up Survey Forms 40

D. Module Evaluation Forms 45

LIST OF FIGURES

Figure 1. High-Tech Curriculum Updating Process. 7

Figure 2. Outline for Participating Educator Orientation . . 8

Figure 3. Objective - Competency Matrix. 18

Figure 4. Curriculum Workshop Agenda 21

Figure 5. Instructional Module Content 23

High-Technology Curriculum Updating Process

Introduction

This module describes the processes used in the High-Technology Training Model Project to identify and develop new content for high school and postsecondary courses. Techniques for identifying new technology being used by local business and industry, procedures for isolating the competencies related to this technology, and processes for developing instructional modules are included. This module presents a discussion of the system used. In some instances the reader will be referred to other modules for more detailed instructions on how to conduct certain activities.

Purpose

The purpose of this module is to provide a comprehensive description of the processes used to identify new competencies and update courses.

Objectives

This module is designed to:

1. Describe the system used to identify high-technology competencies and revise courses.
2. Provide the information and procedures needed to plan and conduct the high-technology curriculum enhancement process.
3. Provide the instructions and procedures needed to identify changes in technology and related systems in the workplace.
4. Define a process for analyzing the change data to identify relevant content for existing programs and courses.

5. Describe how the process can be used to update courses.

Applications of the Process

The processes described in this module can be useful in situations where it is important to keep programs and courses current with the technology being used in the workplace. It can also be used to identify applications of more traditional content in math, science and communications. The process was designed to identify new content that can be infused in existing courses. The intent was not to develop new programs per say. However, there may be situations in which the content has changed so drastically, that it would merit developing a new course or courses. When this happens one should also look at what can be eliminated from the curriculum.

The instructional design portion of the model is based on a modulerized approach to instructional development and competency-based education. The module approach was used to provide flexibility. A module is designed around a competency or related set of competencies. They are designed to be used and linked in a variety of configurations to meet a variety of needs. For example, a set of modules could be configured to provide the basis for a course at the technical college level. A sub-set of these modules could be selected and used to provide specific in-plant training for a company. The modules are not designed to be used by students as an individualized package. A knowledgeable instructor plus the module are required to produce effective learning.

The model also uses a team approach to identifying the competencies and developing the modules. Ideally, teachers from a variety of disciplines in a school district should be involved in the business/industry interviews. This will allow them to determine how their disciplines relate to what is happening in the world of work. It will also provide them with ideas and problems for activities in their classrooms and laboratories. When possible, the process should include teachers from one and two year postsecondary programs. These teachers also need to keep current with technological changes, moreover, their technical expertise will contribute an additional dimension to the curriculum development workshops.

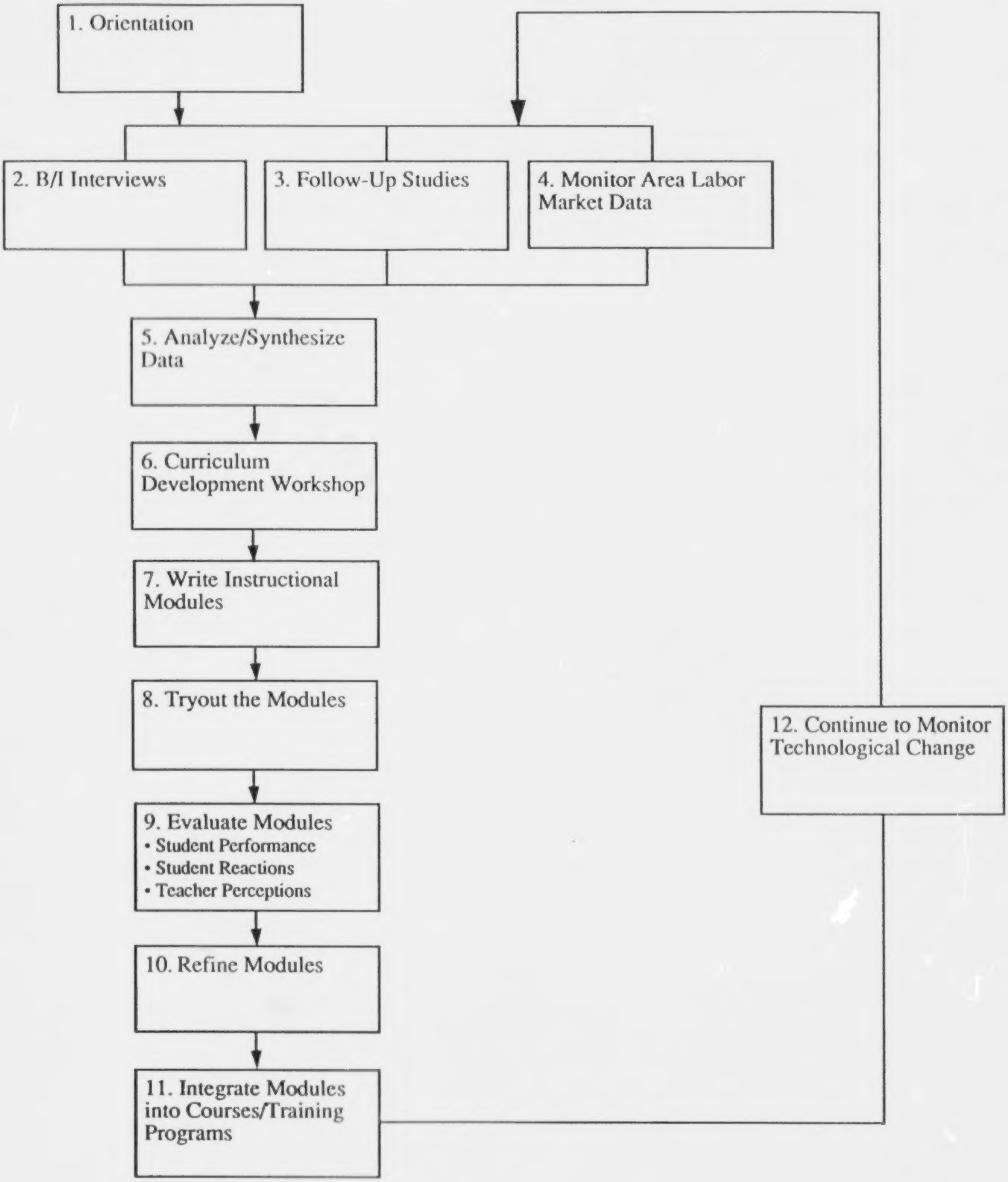
The Process

The flow chart in Figure 1 describes the sequence of steps that was involved in the high-technology curriculum development process. Each of the steps is described in more detail in the paragraphs that follow. In addition, some of the steps have more detailed instructions presented in separate modules. This approach has been successfully used. However, you may find it necessary to tailor it to your particular situation. Use it as a guide and modify it as necessary.

Orientation

The first portion of this process focuses on the identification of new technology that is being used in the workplace or is being considered by local companies. One of the major activities is a series of interviews in business and industry. In order to maximize the effectiveness of these interviews, educators need to know what information is needed and how it will be used in later stages in the process. Therefore, it is necessary during the orientation to orient them to major changes that have been taking place in the area labor market, the business/industry interview process, and the nature of competency-based education.

Figure 1 High-Tech Curriculum Updating Process


1. Orientation
2. B/I Interviews
3. Follow-Up Studies
4. Monitor Area Labor Market Data
5. Analyze/Synthesize Data
6. Curriculum Development Workshop
7. Write Instructional Modules
8. Tryout the Modules
9. Evaluate Modules
• Student Performance
• Student Reactions
• Teacher Perceptions
10. Refine Modules
11. Integrate Modules into Courses/Training Programs
12. Continue to Monitor Technological Change

The amount of time required for this orientation will depend upon the experience and background of the teachers involved. If they are experienced in developing competency based instructional materials, this portion of the orientation will take only a brief period of time. If they are not, they will need an orientation to the basic principles. An outline of the topics for the orientation session is given in Figure 2.

Figure 2. Outline for Participating Educator Orientation

1. Importance of updating courses
2. Competency Based Education (CBE)
    a. Nature of competencies
    b. Identifying competencies
    c. Competency based objectives
    d. Designing CBE learning experiences
    e. Competency based evaluation
3. Major changes in the labor market
    a. Labor market data
    b. Follow-up studies
    c. Changes in the past decade
    d. Major trends
4. High-Tech Curriculum Development Process
    a. Philosophy
    b. Steps
    c. Procedures

(Figure cont.)

5. Businesses/Industry Interviews
    a. Purpose
    b. Process
    c. Interviewing techniques
    d. Interview questions
    e. Form interview teams
    f. Select B/I to visit
    g. Procedures for processing the results

B/I Interview Surveys

The purpose of the B/I interview surveys is to have educators interact with people from area companies in a semi-structured setting. Educators have questions to ask but also have the freedom to discuss other topics. The questions will direct them to gain information on technology that has been recently added to the workplace and new technologies being considered. In addition, teachers need to look for applications of their disciplines.

The first step in the business interview process is for the participating teachers to select the companies they will visit. If several people are interested in visiting the same company, they should consider teaming up and going on the same visit. This would save time for the people being interviewed at the company. Also, it would allow the teachers to compare notes on their visits and interviews. The companies selected should give a cross-section of the types of employment opportunities available in the community and area. In addition, some of the companies should be innovative, i.e., those who are leaders in adopting new technology.

The module on the business/industry interviews presents more detailed instructions on how to conduct the interviews, questions asked, and the procedures to be employed in setting up the interviews. A copy of the interview questions is included in Appendix A of this module.

Follow-up Studies

Educators participating in the project were asked to conduct follow-up studies with former students who were one and five years out of high school. The one-year group was selected to provide information on the transition from school to work or advanced education. The five-year group was included to provide information on the post-secondary education and work experiences of former students.

A sample set of follow-up survey forms is included in Appendix B. These surveys provide valuable feedback on the extent to which high school courses, programs and experiences have prepared students for the tasks and situations they face after high school. The open-ended questions at the end of the survey provide information on the new technology employers have implemented and the types of changes former students are experiencing in their work.

A specific module on follow-up studies has been developed. The reader should refer to this when planning and conducting the follow-up study. Modules on follow-up studies and sampling are included in this handbook.

In many instances, schools follow-up with their graduates. However, it is also recommended that students who do not graduate be contacted to find out what their educational and work experiences have been since leaving school. These former students may be able to offer some valuable suggestions on how programs could be improved in order to retain more students through graduation.

The follow-up studies also provide information on the former students' employers. When students provide employers' names and addresses, it is possible to contact employers and obtain feedback on graduates. The purpose of this type of employer follow-up survey is not to evaluate specific students but to provide a reference point to use in evaluating the degree to which your school's programs have developed the competencies and skills needed by successful employees.

General surveys of employers and business/industry interviews described in Step 2 give feedback on the employers' perceptions of the entering competencies of the general work force. Often times there is a halo affect in these perceptions. The traits of a few poorly qualified employees may be generalized to all employees. Therefore, it is important to obtain feedback on former students who have completed specific types of programs in your school system. Sample employer follow-up survey forms are included in Appendix C. Also, the module on follow-up studies will be useful in conducting this type of follow-up study.

To be effective, follow-up studies should be conducted on a regular basis. It may not be necessary to conduct a five-year follow-up study with every group of high school students. However, a systematic plan and schedule should be developed for doing these. It would be more important to conduct a one-year follow-up study each year. This follow-up study is very sensitive to the types of changes that are taking place in the workplace and the needs of students who are leaving school for education or employment.

An effective follow-up study will require at least two to three months to complete. Thus, it will need to be planned and scheduled so that the results are available for later steps in the curriculum development process.

Monitor Area Labor Market Data

Information on sources of labor market data was included in the orientation session. This session also provided some up-to-date information on area labor market trends. Teachers need to be encouraged to monitor these information sources, area newspapers, television newscasts, and other area events to identify changes taking place in the regional labor market. In addition, one or two staff people should be identified and asked to give special attention to monitoring area labor market data. These people might regularly review the regional and state publications on the labor market. In addition, they need to monitor local and area newspapers, journals, and business news on

TV. Since this information is not always of great interest to teachers in general, it would be well to select staff members who have a special interest in this type of information and/or need to regularly make use of it in their work.

Other sources can provide effective input. An advisory committee comprised of people from business and industry will provide valuable input on changes in systems, technology, and works. Advisory committee members also should be asked to look ahead - at least to the next three to five years. A Delphi study could be conducted to obtain more long-term future projections. In addition, area labor market studies might be done by selected classes.

Analyze/Synthesize Data

The data acquired through the business/industry interview surveys will not be readily quantifiable. Each interviewer will need to record the technology, ideas, and suggestions identified during each interview. The interviewers may want to do some summary tallies to determine the frequency with which certain types of new technology were mentioned during the interviews or observed during the visits. However, a lot of the information gathered during these interviews will be in the form of impressions and feelings developed by the interviewers.

It is suggested that the educators participating in the business interview process meet in small groups and use a nominal group or similar process to identify the changes and competency needs they perceived during their interview visits. During the initial part of this process, these changes and needs should be listed through a brainstorming process. After this has been done, these items can be grouped and prioritized. A module on small group processes is included in this handbook.

After the technological changes have been identified, the groups can look at the implications of these changes for school programs. The types of competencies needed by people entering the work force can be identified. These competencies can then be related to specific courses and programs in your school. For example, the increasing use of CAD might be given a high priority during this group process. An analysis of the competencies required to use CAD might include the following.

1. Keyboarding - math and business education courses.
2. Drafting principles - technology education.
3. Style and design - art and technology education courses.
4. Geometry used in designing and drafting - math courses.

After the small groups have completed their discussions, they could meet and report their results to the total group. It may be desirable at this time to redivide the groups by discipline or subject matter area and have them review the implications again. The competency lists and related courses identified by each group should be reviewed and consensus areas identified. For further information on group processes, review the module on this topic.

At this point, one also needs to consider the results of the follow-up study and the monitoring of area labor market data. The follow-up and labor market data will be in a more quantified form. There are various strategies that might be used to disseminate this information. Each staff member might be asked to read a report of the results of the follow-up study and a summary of area labor market trends. Considering human nature and the large number of documents typically distributed to educators, it would probably be more effective to have a team of two or three people responsible to analyze and report the results of the follow-up study and another team of similar size to report the results of monitoring area labor market data. It is recommended that the follow-up data be presented first. It deals more specifically with the products of your school programs and how they fare in labor market and advanced educational programs.

The follow-up data should be presented and discussed with the participants in the small groups. The overall results should be presented first. After that has been done, the presenters may want to identify major outcomes they have perceived in their analyses. However, these conclusions need to be discussed by the teachers and administrators in the small groups.

Next, the information on the local or area labor market should be presented. As with the follow-up results, one or two staff members could be responsible for synthesizing and presenting this information. In addition, they may want to develop a list of implications for your school's programs and courses. After these two presentations, the participating teachers and administrators can meet in their small groups to discuss the implications of this information. The same group process as used in stage one with the business/industry survey results can be employed. Each group should develop a list of implications for your school programs and courses.

After the implications have been identified, they should be contrasted with the results from the discussions of the business/industry interviews. Areas in which there is solid agreement reinforce each other and should be given more precedence in determining the priority for changes in courses and programs. Areas in which there are conflicts suggest a need for gathering more information to resolve these conflicts.

The next step is to look at these implications and isolate competencies that need to be developed. In some instances, the implications will be stated in a competency format, in other words, the types of behaviors and skills students need to have as they enter the work force or advanced educational programs will be embedded in the statements. If they are not, competency statements will have to be written which are specific enough so they can be compared with program and course objectives to determine if they are included or not.

The next step will be to contrast the competency areas and competency statements developed by the small groups with the contents of specific courses. In order to do an effective job of this analysis, the course objectives need to be stated in behavioral or competency form. If they are not, it will be difficult to do an effective analysis. During this analysis, two things need to be checked. First, you need to determine whether the competency is developed in existing courses. Second, if you find that current course content and activities relate to one or more of the competency areas identified, also check to be sure that students are learning how to apply these competencies to real world tasks. Often students are exposed to relevant content but there is a failure to relate these competencies to practical situations. As a result, students do not know how to make use of the knowledge they have as they work in practical situations.

One effective way of conducting an analysis and determine the areas in which further work is needed, it to develop a course objective-competency matrix. A partial objective-competency matrix is given as an example in Figure 3 for the CAD illustration mentioned above. The rows of the matrix can be used to identify the objectives for a given course. The columns can be used to list the new competencies areas and competencies identified through the B/I interview, follow-up and labor market analysis processes. Checkmarks can be placed in the appropriate cells to indicate if and where the new competencies are covered. Another symbol can be used to identify potential areas for application of these competencies.

Figure 3. Objective - Competency Matrix

Course: GRAPHIC COMMUNICATIONS I

Computer Aided Design (CAD)

Existing Course Objective	Identified New Competencies			
	Keyboarding	Drafting Principles	Principles of Design	Geometric Analysis
1. Use keyboard to center data	X			
2. Use mouse to enter data	X			
3.				
.				
.				
(n).				

Curriculum Development Workshop

The next step in the process is to conduct a one week curriculum workshop for the project participants. The objectives of the workshop and its contents would be based on the needs of the participating educators. An example outline of a workshop agenda is given in Figure 4. Prior to the workshop, staff members should contact the participants and asked them to identify competency areas in which they wanted to work during the curriculum development phase. Their decisions should be based upon their interviews with local industry, local programs, and information that staff had provided. During the High-Technology Training Model Project, participating teachers identified four major areas in which they wanted to work: (a) new manufacturing technology, (b) communications, (c) employability skills, and (d) self-managed work teams. In addition to these four areas, the project staff decided to include content on problem-solving. Problem-solving had been identified as one of the major needs by companies in Wisconsin, thus, it was deemed important to include this. Since problem solving is a process, it could be woven into a variety of content modules.

Select presenters who will do an effective job of providing content and technique sessions. Session on curriculum development techniques should focus on processes for developing instructional modules, writing behavioral objectives, and designing valid evaluation activities.

If it is an objective of the workshop to help participating educators develop a training module, then participants should be given adequate time to develop their individual modules as part of the workshop experience. For some participants, this may be their first formal, non-academic experience with developing instructional material. Working with someone developing a similar module, or as a team in the development of a single module may relieve some of the associated anxiety. During the High-Technology Training Model Project Workshop, participating educators were encouraged to work as teams whenever possible, however, this did not occur in some instances. On the last day of the workshop for the High-Technology Training Model Project, participants were asked to evaluate the workshop. Based on the participants evaluations, as well as the project staff's experiences with the workshop format, it is recommended that an additional two days be added to make it a full week. This would provide adequate time for the participating educators to complete the writing of the first module. It is very important to complete the first module so that participants have an opportunity to get a feel for the total process and also for the format of the module.

The workshop format presents an environment within which people can share ideas and assist each other. It is important to have appropriate resource persons and reference materials available. As mentioned above it is important that the participants complete the first module before the end of the workshop. Writing additional modules is much easier. In fact, several of the educators participating in the High-Technology Training Model Project decided to write additional modules during the school year.

Including postsecondary technical college and high school teachers in the same workshop, provides an opportunity to share ideas and information across educational levels. This can be beneficial and lead to some cooperative module development work. During the High-Technology Training Module Project's workshop, some of the participants had three or four correlated modules available to them at the conclusion of the workshop. Each module was written by an individual participant; however, the linkages between modules were developed by the small group.

Another factor in the success of the workshop was the set of reinforcers or rewards set up for the participants. A monetary stipend was provided through the project budget. In some instances this stipend was supplemented by the participant's school system. In addition, college credit was available to the participants at a significantly reduced fee. In place of the usual fees of more than $100 per credit, the participant paid $10 per credit. Also, if the person did not wish to enroll for credit, the workshop could be taken for CEU's. Finally, a modest amount of money was available to each school for procuring audio-visual resources that supported the content of the module.

Figure 4. Curriculum Workshop Agenda

* Introduction to the high-technology curriculum revision process
* High-technology skills - An industry perspective
* Approaches to teaching thinking
* Instructional module development
* Small groups breakout sessions
  (Resource people discussed recent developments in three areas related to the participants' module development activities.)
* Module development time
* Work based learning experiences
* Building fairness and address diversity
* Articulation strategies and techniques
* Evaluation techniques
* Quality concepts (Figure cont.)

- Module development time
- Module review - developer and a project staff member

Write Instructional Modules

As mentioned in the previous step, each participant started an instructional module during the High-Technology Training Model Project's curriculum development workshop. A standard format was presented to the participants. The rationale for this format and its specific contents were discussed in detail. A specific module has been developed on writing instructional modules. For more detailed information on the process, the reader should refer to the Module Development Guidelines included in this handbook.

Two principles guided the design of the Instructional module format for educators participating in the High-Technology Training Model Project. First, the instructional module was to be competency-based. Second, it was to be designed to provide enough flexibility so the module could be used in different settings and linked with content in an existing course. Figure 5 shows what the content of each module should include.

Figure 5. Instructional Module Content

- I. Title
- II. Description
- III. Name and School
- IV. Objectives
  - A. Purpose
  - B. Benefit of objectives
  - C. Components of objectives
    - 1. Condition
    - 2. Performance
    - 3. Criteria
- V. Content Outline
- VI. Methodology
- VII. Activities
  - A. Relationship to objectives
  - B. Student
- VIII. Resources
- XI. Evaluation
  - A. Relationship to objectives
  - B. Paper and pencil
  - C. Product/process

During the High-Technology Training Model Project, workshop staff made it a point to work with each of the participating teachers and to contact them two or three times a day during the time they are working on their modules. Also, resource people in the areas of flexible manufacturing, communications, and small group leadership were available. Emphasis was given to assuring that the content and learning activities directly related to the competencies identified in the objectives of the module. Participants had the most difficulty in developing an effective evaluation for their modules. Since the modules were competency-based and dealt with the use or application of high-technology concepts, the standard evaluation questions and techniques did not serve real well. One session in the workshop dealt with evaluation. However, there was not enough time to work with each participant and apply the techniques to his/her module. If the workshop had been approximately two days longer, evaluation techniques could be discussed near the close of the workshop when the participants are ready to develop this portion of the module. This would be a more effective approach. Evaluation techniques that are appropriate to higher levels of the taxonomy; application, analysis and synthesis need to be presented.

Try Out The Modules

Instructors participating in the High-Technology Training Module Project were asked to try out their modules at appropriate points in their courses. Instructors from the postsecondary technical college system are also encouraged to use the modules in special in-plant training as well as in their regular courses. Almost all of the participating teachers were able to try out their modules and have them evaluated by their students.

During the try out, teachers were encouraged to identify areas that needed to be improved, expanded or changed. As these modifications were sent back to the project staff, the changes were entered into the projects' word processing system and revised copies were sent to the teacher.

Evaluate The Modules

Three types of evaluation data were collected. The teacher's perceptions of the quality and effectiveness of the module were obtained through a teacher evaluation form. Students provided two types of evaluation information. First, their performance on the test developed by the author of the module was analyzed. Second, each student completed a rating scale on the module. The rating scale was developed by project staff so it was the same for each of the modules evaluated. All of the evaluation forms used are included at the end of this module in Appendix D.

Overall, the teachers gave very positive evaluations to the modules they had developed and to the module format. This does not mean that they did not find areas in which the modules could be improved. Most of the teachers found something that they wanted to change and refine. However, they were satisfied with the module approach and indicated that it was a functional way to integrate new content in existing courses.

Students also responded positively to the modules. They indicated that they had learned new content and competencies that would be useful to them in the future. They also reported that the modules were interesting and functional. More information on evaluation is given in the Evaluation Module included in this handbook.

Refine The Modules

The most opportune time to refine a module is right after it has been used. At that point in time, the experiences gathered through using the module will be fresh in mind. Also, the student evaluation results will be readily available, and any other comments and reactions that students may have had that were not recorded in the student feedback forms will be remembered.

Student performance test results should be analyzed item by item to determine those areas in which more emphasis needs to be given. For example, if students perform poorly on the items related to one of the objectives in the module, the content and learning activities should be modified and/or expanded to assure that this objective is attained when the module is used again. After the module has been revised, the writer should look at the types of changes made and the implications for the module writing process. In other words, the process should be revised so that the same mistakes are not made in the future. The process of using and evaluating, the first module should provide feedback that would be valuable in making the following decisions.

1. How much detail should one include in the content area?
2. What types of class activities are most effective?
3. What types of student assignments should be made?
4. What types of activities are of most interest to students?
5. What types of activities are most effective in accomplishing the module objectives?
6. Were appropriate audio-visual aids included?
7. What evaluation processes are most appropriate? Especially important here are the techniques that assess higher levels of learning such as application, analysis and synthesis (problem solving).
8. How efficiently does this module link with other content in the course?
9. Is the amount of content covered in the module

appropriate?

The module writer may wish to make note of the types of changes that needed to be made and refer to these as additional modules are developed. The first few modules provide an excellent learning process if the evaluation phase is included and feedback provided. Also, the person who is responsible for the overall project can learn from looking at a summary of the types of changes that need to be made in the modules. This information can be used to improve the instruction on the module development process.

Integrate Modules Into Courses

Once a module or set of modules has proven to be effective and relevant, it should be integrated into the overall course. During the try-out and evaluation phases, the modules were used in an appropriate place within a course. After they have been used, tested and refined, it is appropriate to fully integrate them into the course outline. This can be done by identifying where they will be taught and writing the introductory material so that the module links together with the instruction the precedes and follows it. As more modules are developed the teacher can link these together to form units of instruction and full courses. Often it will be necessary to develop some instructions for the teachers and materials for students that will facilitate the transition from one module to another.

As educators become more competent in developing and using modules, they should be able to select from a set of existing modules and quickly put together a unit of instruction or a specialized training program. Research, conducted by the University of Wisconsin-Stout's Center for vocational, Technical and Adult Education indicates that business and industry want to have training programs that are ready when they need them, high quality, and tailored to their needs. An easy way to remember this is to use the acronym Q^2T. The acronym stands for quick, quality and tailored. Quick represents the idea that companies want to have training delivered as soon as possible after a specific need has been identified. They usually do not want to wait until a new semester or a new school term starts. Quality reflects the desire of business and industry to have the best instructors and the best instructional materials that are available related to their needs. They are concerned that the instruction be effective and that their employees develop new work patterns which will be more productive. Tailored indicates that the content of a training program must be focused specifically on the needs of a particular business or industry. A company does not want to have time spent on the competencies and concepts that do not relate to its needs. Moreover, employees want competencies that they can use directly in their work. They will lose interest when content that is not directly related to, or does not have an obvious link with their training needs, is presented. This can cause them to lose interest and drop out of the training program.

Assuming that a valid needs assessment has been done and that relevant modules have been selected, some fairly simple changes can be made in the modules to make them more interesting and relevant to the participants. If the module is valid in relation to the need, you will not want to change the competencies that are being developed by the module. In other words, the content is going to remain relatively stable.

However, the teaching examples and learning activities, i.e., the processes used in instruction, can be modified to make the modules more relevant. For example, if a training program on programmable logic controllers (PLCs) is taught, the types of PLCs discussed can be those used in the plant and the problems given for students to solve could deal with the types of applications found in the company.

An effective process to use in identifying these applications and examples is to do a pre-training program visit to the company. During this visit, you will be able to obtain a better idea of the specific needs of the people who will be in the training program and their current level of expertise. In addition, information on the types of equipment used, problems encountered, and applications can be acquired. This will allow you to tailor the instruction to the needs, background and interests of the employees to be involved in the training program.

Continue to Monitor Technological Change

There is an old phrase that "there are only two things that are certain in life....". Another item can be added to that list, change. As new knowledge is developed at an increasing pace and the world marketplace develops, change is going to be a constant in our lives.

The high technology curriculum revision process was designed to be a dynamic process. One of the important steps in making this process dynamic is the continued monitoring of change. Steps two, three and four in the process provide valuable data on changes taking place in the workplace. These steps need to be continued. Staff members should be involved in visiting and interviewing people in business and industry on a regular basis. This activity might be scheduled each calendar year or it could be done every other year. The two-year cycle, however, is the longest that should be maintained between these visits. In fact, it would be better to have a continuing relationship with the companies in your labor market area.

Follow-up survey information from former students and graduates will provide an ongoing picture of changes in the workplace. One-year follow-up surveys identify problems that former students have in making transitions into the workplace and advanced educational programs. The five-year follow-up studies provide information on changing technology in the workplace and the needs of former students as they advance in their careers. Input from employers should also be obtained as a part of the follow-up process.

Data on the area labor market needs to be continually monitored. A minimum of one or two staff members should be assigned to monitoring and assembling this information. Special reports provide valid information on the changing nature of your area labor market. Feedback from graduates and former students also helps to identify the appropriate labor market region for your school district and the types of changes taking place within it. Other sources of information include scanning professional literature, participating in conferences and attending trade shows. Students who are working on cooperative education assignments or other work based learning experiences should be asked to identify the types of equipment and systems they are working with and the changes they see taking place at their job site. Also, the staff members who supervise these students out at the worksite should be alert to new competencies required and changes in the technology being used by the employers.

Advisory committees can provide valuable input on trends in the area labor market, new technology and systems being implemented in the workplace, and the types of new technology being considered for future implementation. Typically, each vocational program will have an occupational advisory committee. At least a portion of one meeting per year should be devoted to discussing new technology, new competencies needed and future trends in technology and work systems. The advisory committee can also be a valuable sounding board and provide assistance in determine the new competencies that should be placed in courses in your school programs. The results of the small group staff sessions should be presented to the advisory committee for its reactions and suggestions.

Finally, the effectiveness of the modules developed should be evaluated. The results of these evaluation activities must be used to improve the modules and also to improve the module development process.

APPENDIX A

Business/Industry Interview Questions

B/I INTERVIEW SURVEY

Directions: Interview three to five people in local businesses or industries. If possible, select B/I's that employ your graduates. Record the major comments on this form. You may want to ask other questions as well.

Business/Industry______________________________ Date_______________

Address_________________________City________________Zip__________

Person(s) Interviewed:____

Interviewer:____

1. What are your major products/services? (If you already know, then go to question 2).

2. How many people do you employ in this city or country? _______________

3. What new technology have you just brought or are you bringing into the company? (New technology - equipment, processes, management techniques, etc.)

4. What new technology are you planning to use in the next 3 - 5 years?

5. What new skills or competencies do your employees need?

6. How are these skills/competencies developed? (ie. the skills listed in 4).

7. What additional skills do graduates from our school need as they start work with your company? (If possible, refer to a specific graduate or graduates who have worked at this company).

8. Ask how they work with local schools. Some examples are given below:

    a. Serve on advisory committees

    b. Teach a course(s)

    c. Visiting speaker

    d. Provide cooperative education work sites

    e. Provide work experiences for students

    f. Provide summer work experience for teachers

    g. Provide shadowing experiences for students

    h. Host student tours/field trips

    i. Other ________________________________

9. If they do not do any of the activities listed in seven, ask if they would be interested in one or more of these.

10. Would your company be willing to serve as an intern (explain) site for a teacher this summer? (ie. Provide paid work experiences or opportunities to shadow/observe in the company).

APPENDIX B

One and Five-Year Follow-Up Surveys

- One-Year (BG-1)
- Five-Year (BG-5)

We are presently doing an evaluation of our school district's programs. We want to improve these programs and also wish to determine job and educational preparedness of all graduates. Your honest input will be appreciated.

Student Name
High School

(For School Use)

1. IPC | SEQUENCE | GE
2. AG 1 | BE 2 | HO 3 | HE 4 | ME 5 | TE 6
3. H 1 | DI 2 | DO 3
4. AIN 1 | API 2 | BNH 3 | HIS 4 | WNH 5

5. (1) ___ Male (2) ___ Female

6. I am presently *(Please check one of these following seven statements.)*
Full time employed: 32 hrs/week or more;
part-time employed: less than 32 hrs/week.

(1) ____ employed FULL time in a nonmilitary occupation.
(2) ____ employed FULL time in the military service.
(3) ____ employed PART time--not in school.
(4) ____ employed PART time while in school.
(5) ____ full-time student--not employed. *(If checked go to #15.)*
(6) ____ unemployed but looking for paid employment. *(If checked go to #15.)*
(7) ____ unemployed, not looking for paid employment. *(If checked go to #15.)*

7. Do you own or operate your own business?

(1) ____ Yes, full-time
(2) ____ Yes, part-time
(3) ____ No

8. What is your present hourly wage including tips? (Do not include overtime)

$______/hour # hours/week ______

If you are not paid on an hourly basis, please respond as follows:

__________ $ amount __________________ number of hours per pay period

9. (1) Job Title ______________________________
(2) Job Duties ______________________________
____
(3) Zip code of city in which you work ____________

10. May we contact your supervisor in our Employer Follow-up? (His/her response will be kept anonymous)

(1) ____ Yes ______________________
(2) ____ No *(your signature)*

11. Supervisor's name: ______________________
Business name: ______________________
Address: ______________________
____

12. Did your high school preparation help you to obtain your present job? *(Check one)*

(1) ____ Considerably
(2) ____ Somewhat
(3) ____ Very little
(4) ____ None

13. Is this job related to your area of high school preparation? *(Check one)*

(1) ____ directly related *(in same job area as high school preparation)*
(2) ____ somewhat related *(using some skills learned in high school courses)*
(3) ____ not related

14. What parts of your high school preparation have been of greatest value in your present job? *(Check all that apply)*

(1) ____ General job skills (work habits, working with others, etc.)
(2) ____ Specific job skills
(3) ____ Career awareness and information
(4) ____ General preparation
(5) ____ English skills
(6) ____ Math skills
(7) ____ Science skills
(8) ____ Computer skills
(9) ____ Other ______________________

15. How do you feel about the courses you took at your high school? *(Check one)*

(1) ____ I was very Satisfied
(2) ____ I was Satisfied
(3) ____ I was UNsatisfied
(4) ____ I was very UNsatisfied

16. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

17. Are you currently attending a school/educational program? *(Check one)*

(1) ____ a GED (High School Equivalency) program
(2) ____ a vocational-technical school diploma program one-year or less
(3) ____ a vocational-technical school two-year associate degree program
(4) ____ a two-year UW-Center program
(5) ____ a four-year university or college program
(6) ____ an apprenticeship program
(7) ____ an in-service or on-the-job training program
(8) ____ private school program
(9) ____ I am not attending school
(10) ____ other ______________________

18. If you checked a school/educational program in #17, please list your current program/area of study.

____
Name of current program/area of study

____
Name of school-location

1	2	3	4	5

Please turn page

In general, how adequate was your high school preparation in the following situations or life skills: *(Please circle number 5, 4, 3, 2, or 1 for each statement.)*

	More Than Adequate		Adequate		Not Adequate
19. Seeking a job	5	4	3	2	1
20. Learning specific job skills	5	4	3	2	1
21. Learning specific job knowledge	5	4	3	2	1
22. Getting along with others	5	4	3	2	1
23. Being able to talk to the boss about your problems	5	4	3	2	1
24. Understanding the value and importance of work	5	4	3	2	1
25. Solving problems	5	4	3	2	1
26. Understanding the U.S. and world economic systems (supply-demand, inflation, recession, etc.)	5	4	3	2	1
27. Understanding how a business makes a profit	5	4	3	2	1
28. Understanding alternatives for solving home and family related problems	5	4	3	2	1
29. Understanding child growth and development and parenting responsibilities	5	4	3	2	1
30. Managing career responsibilities with home and family responsibilities	5	4	3	2	1
31. Applying basic skill preparation in math, reading, writing, spelling, speaking, listening to every day problems	5	4	3	2	1

In general, how adequate was the career planning assistance and information you received at your high school? *(Please circle number 5, 4, 3, 2, or 1 for each statement).*

	More Than Adequate		Adequate		Not Adequate
32. Determining my skills, interests and abilities	5	4	3	2	1
33. Opportunity to hear speakers from the world of work	5	4	3	2	1
34. Presentation of role models in nontraditional areas (i.e., female mechanics/male nurses)	5	4	3	2	1
35. New and/or future oriented occupations	5	4	3	2	1
36. Jobs held by primarily males or primarily females	5	4	3	2	1
37. Occupations which have local job opportunities	5	4	3	2	1
38. Jobs which become outdated, overcrowded or offer no opportunities for advancement	5	4	3	2	1
39. Post-high school educational opportunities related to my career goal	5	4	3	2	1
40. Job alternatives related to my career goal	5	4	3	2	1
41. How to find a job/how to apply for a job	5	4	3	2	1
42. How to start a business	5	4	3	2	1
43. Selecting a career	5	4	3	2	1
44. Adapting to change	5	4	3	2	1

45. What is your home zip code? ____________________

46. *What additional skills and knowledge could you have used as you went from high school to work or further education?*

____

____

____

____

47. Yes ____ No ____ Would you like a copy of the survey summary? If yes, please give your name and mailing address.	Name ____________________ ____________________ City ____________ State _____ Zip ______

Thank you for responding. Please return this completed survey in the enclosed prepared envelope. Add any additional comments on the back of the cover letter and also return.

CVTAE/HIGH TECH
(HI 7298 B2 1 - Math)

FIVE-YEAR FOLLOW-UP SURVEY

Form BC-5
Page 1

We are presently doing an evaluation of our school district's programs. We want to improve these programs and also wish to determine job and educational preparedness of all graduates. Your honest input will be appreciated.

Student Name
High School

(For School Use)

1	IPC	SEQUENCE	GE			
2.	AG 1	BE 2	HO 3	HE 4	ME 5	TE 6
3	H 1	DI 2	DO 3			
4.	AIN 1	API 2	BNH 3	HIS 4	WNH 5	

START HERE

5 (1) ____ Male (2) ____ Female

6 I am presently. *(Please check one of these following seven statements.)*
Full-time employed: 32 hrs/week or more;
part-time employed: less than 32 hrs/week.

(1) ____ employed FULL time in a nonmilitary occupation.
(2) ____ employed FULL time in the military service.
(3) ____ employed PART time--not in school.
(4) ____ employed PART time while in school.
(5) ____ full-time student--not employed. *(If checked go to #15.)*
(6) ____ unemployed but looking for paid employment. *(If checked go to #15.)*
(7) ____ unemployed, not looking for paid employment. *(If checked go to #15.)*

7. Do you own or operate your own business?

(1) ____ Yes, full-time
(2) ____ Yes, part-time/second income
(3) ____ No

8 What is your present hourly wage including tips? (Do not include overtime)

$______/hour # hours/week ______

If you are not paid on an hourly basis, please respond as follows:

__________ $ amount
__________ number of hours per pay period

9. (1) Job Title ______________________________
(2) Job Duties ______________________________
____
(3) Zip code of the city in which you work __________

10. May we contact your supervisor in our Employer Follow-up? (His/her response will be kept anonymous)

(1) ____ Yes ______________________
(2) ____ No *(your signature)*

11. Supervisor's name: ______________________
Business name: ______________________
Address: ______________________
____

12. Is this job related to your area of high school preparation? *(Check one)*

(1) ____ directly related *(in same job area as high school preparation training)*
(2) ____ somewhat related *(using some skills learned in high school courses)*
(3) ____ not related

13 Did your high school preparation help you to obtain your present job? *(Check one)*

(1) Considerably
(2) Somewhat
(3) Very little
(4) None

14. What parts of your high school preparation have been of greatest value in your present job? *(Check all that apply)*

(1) ____ General job skills (work habits, working with others, etc)
(2) ____ Specific job skills
(3) ____ Career awareness and information
(4) ____ General preparation
(5) ____ English skills
(6) ____ Math skills
(7) ____ Science skills
(8) ____ Computer skills
(9) ____ Other ______________________

15. How do you feel about the courses you took at your high school? *(Check one)*

(1) ____ I was very Satisfied
(2) ____ I was Satisfied
(3) ____ I was UNsatisfied
(4) ____ I was very UNsatisfied

16. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

17. Since leaving high school, *(Check all that apply)*

(1) ____ I have received one or more job promotions
(2) ____ I have changed jobs one or more times
(3) ____ I am doing the same work that I did immediately following high school graduation

18. Since leaving high school, I have completed or am presently enrolled in: *(Check all that apply)*

(1) ____ a GED (High School Equivalency) program
(2) ____ a vocational-technical school diploma program one-year or less
(3) ____ a vocational-technical school two-year associate degree program
(4) ____ a two-year UW-Center program
(5) ____ a four-year university system or college program
(6) ____ an apprenticeship program
(7) ____ an in-service or on-the-job training program
(8) ____ private school program
(9) ____ I have not taken any additional training
(10) ____ other ______________________

19. If you checked a school/educational program in #18, please list your most current program/area of study.

____
Name of current program/area of study

____
Name of school - location

1	2	3	4	5

In general, how adequate was your high school preparation in the following situations or life skills: *(Please circle number 5, 4, 3, 2, or 1 for each statement.)*

	More Than Adequate		Adequate		Not Adequate
20. Seeking a job	5	4	3	2	1
21. Learning specific job skills	5	4	3	2	1
22. Learning specific job knowledge	5	4	3	2	1
23. Getting along with others	5	4	3	2	1
24. Being able to talk to the boss about your problems	5	4	3	2	1
25. Understanding the value and importance of work	5	4	3	2	1
26. Solving problems	5	4	3	2	1
27. Understanding the U.S. and world economic systems (supply-demand, inflation, recession, etc.)	5	4	3	2	1
28. Understanding how a business makes a profit	5	4	3	2	1
29. Understanding alternatives for solving home and family related problems	5	4	3	2	1
30. Understanding child growth and development and parenting responsibilities	5	4	3	2	1
31. Managing career responsibilities with home and family responsibilities	5	4	3	2	1
32. Applying basic skill preparation in math, reading, writing, spelling, speaking, listening to every day problems	5	4	3	2	1

In general, how adequate was the career planning assistance and information you received at your high school? *(Please circle number 5, 4, 3, 2, or 1 for each statement).*

	More Than Adequate		Adequate		Not Adequate
33. Determining my skills, interests and abilities	5	4	3	2	1
34. Opportunity to hear speakers from the world of work	5	4	3	2	1
35. Presentation of role models in nontraditional areas (i.e., female mechanics/male nurses)	5	4	3	2	1
36. New and/or future oriented occupations	5	4	3	2	1
37. Jobs held by primarily males or primarily females	5	4	3	2	1
38. Occupations which have local job opportunities	5	4	3	2	1
39. Jobs which become outdated, overcrowded or offer no opportunities for advancement	5	4	3	2	1
40. Post-high school educational opportunities related to my career goal	5	4	3	2	1
41. Job alternatives related to my career goal	5	4	3	2	1
42. How to find a job/how to apply for a job	5	4	3	2	1
43. How to start a business	5	4	3	2	1
44. Selecting a career	5	4	3	2	1
45. Adapting to change	5	4	3	2	1

46. What is your home zip code? ____________________

47. *What additional skills and knowledge did you have to learn in order to keep up with changes in your job.*

____

____

____

48. *Additional skills or knowledge you will need to learn in the near future in order to keep up with changes in your job.*

____

____

____

49. Yes ____ No ____ Would you like a copy of the survey summary? If yes, please give your name and mailing address.

Name ____________________

____

City ____________________ State ____ Zip ________

Thank you for responding. Please return this completed survey in the enclosed prepared envelope. Add any additional comments on the back of the cover letter and also return.

APPENDIX C

Employer One and Five-Year Follow-Up Survey Forms

*Employer One-Year Follow-Up Study (Form C1)

*Employer Five-Year Follow-Up Study (Form C2)

CVTAE/DPI	**EMPLOYER - ONE-YEAR FOLLOW-UP STUDY**	Form C1
III 7297 C1 1	Secondary Vocational Program Evaluation	*Page 1*

Dear Supervisor/Employer,

We are in the process of evaluating our school district's vocational programs and have received written waiver from your employee to contact you. Since this will provide valuable data for our district with respect to program improvement as well as job and educational preparedness of graduates your honest input is vital. Your cooperation will be appreciated. No student, employer or identifiers will be presented in our reports. Start with item 7.

Employee
High School
Area of High School Vocational Preparation

(For School Use)

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DL	ID

4.

Male	Female
Graduate	

5.

FT	PT
Graduate	

6.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

Please rate the individual in the following areas: ***(Circle the appropriate responses)***

START HERE

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)
7. Occupational knowledge	5	4	3	2	1
8. Occupational skills	5	4	3	2	1
9. Work attitude	5	4	3	2	1
10. Work quality	5	4	3	2	1
11. Work quantity (amount produced)	5	4	3	2	1

In the following areas of basic skills, how well prepared was this employee? ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
12. Reading	5	4	3	2	1	0
13. Spelling	5	4	3	2	1	0
14. Computer literacy	5	4	3	2	1	0
15. Math	5	4	3	2	1	0
16. Science	5	4	3	2	1	0
17. Writing	5	4	3	2	1	0
18. Speaking	5	4	3	2	1	0
19. Listening	5	4	3	2	1	0
20. Problem solving	5	4	3	2	1	0

Please rate this employee on each of the characteristics listed below. ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
21. Use of tools and equipment	5	4	3	2	1	0
22. Selection and care of space, materials, and supplies	5	4	3	2	1	0
23. Ability to work with co-workers	5	4	3	2	1	0
24. Accepting advice and supervision	5	4	3	2	1	0
25. Working in a leadership role when applicable	5	4	3	2	1	0
26. Understanding the value and importance of work	5	4	3	2	1	0
27. Prompt and dependable in attendance	5	4	3	2	1	0
28. Willing to accept and perform tasks	5	4	3	2	1	0
29. Ability to plan and direct own work	5	4	3	2	1	0
30. Ability to make sound decisions	5	4	3	2	1	0
31. Shows consideration and kindness towards others	5	4	3	2	1	0
32. Neat, clean, and appropriate appearance	5	4	3	2	1	0
33. Flexibility to accept change	5	4	3	2	1	0
34. Ability to learn new job tasks	5	4	3	2	1	0

35. What is your overall rating of this individual's occupational competence as it relates to his/her job?

(5) ____ Very Good
(4) ____ Good
(3) ____ Acceptable
(2) ____ Poor
(1) ____ Very Poor

36. How would you rate this employee's preparation in relation to other employees in his or her work group?

(3) ____ Individual is better prepared
(2) ____ Both are about the same
(1) ____ Individual is less prepared
(0) ____ No basis for comparison

37. What has been this employee's attitude toward on-the-job training?

(5) ____ Very positive, eager to learn
(4) ____ Positive, willing to learn
(3) ____ Acceptant, but needs prodding
(2) ____ Negative, resists training
(1) ____ No training has been offered

38. If the opportunity should arise, would you promote this employee?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

39. When hiring recent high school graduates, would you prefer to hire persons who have had high school vocational training?

(3) ____ A good deal of preference
(2) ____ Some preference
(1) ____ No preference

40. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

41. In which of the following ways does your business work with secondary schools to support education? *(Please check all that apply)*

(1) ____ Suggesting new vocational courses
(2) ____ Recommending equipment and materials to be used
(3) ____ Providing equipment/materials/donations
(4) ____ Providing facilities
(5) ____ Providing vocational students with work experience
(6) ____ Serving on advisory committees
(7) ____ Providing teachers with work experience
(8) ____ Releasing employees to teach vocational courses
(9) ____ Partnerships

Please comment on:

(1) Additional skills you feel are needed by graduates

____

____

(2) How high school vocational programs could be improved

____

____

(3) What new technologies are coming into your work place

____

____

CVTAE/DPI | **EMPLOYER - FIVE-YEAR FOLLOW-UP STUDY** | **FORM C2**
HI 7298 C2-1 | Secondary Vocational Program Evaluation | *Page 1*

Dear Supervisor/Employer,

We are in the process of evaluating our school district's vocational programs and have received written waiver from your employee to contact you. Since this will provide valuable data for our district with respect to program improvement as well as job and educational preparedness of graduates your honest input is vital. Your cooperation will be appreciated. No student, employer or identifiers will be presented in our reports. Start with item 7.

Employee
High School
Area of High School Vocational Preparation

(For School Use)

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DL	DO

4.

Male	Female
Graduate	

5.

FT	PT
Graduate	

6.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

Please rate the individual in the following areas: ***(Circle the appropriate responses)***

START HERE

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)
7. Occupational knowledge	5	4	3	2	1
8. Occupational skills	5	4	3	2	1
9. Work attitude	5	4	3	2	1
10. Work quality	5	4	3	2	1
11. Work quantity (amount produced)	5	4	3	2	1

In the following areas of basic skills, how well prepared was this employee? ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
12. Reading	5	4	3	2	1	0
13. Spelling	5	4	3	2	1	0
14. Computer literacy	5	4	3	2	1	0
15. Math	5	4	3	2	1	0
16. Science	5	4	3	2	1	0
17. Writing	5	4	3	2	1	0
18. Speaking	5	4	3	2	1	0
19. Listening	5	4	3	2	1	0
20. Problem solving	5	4	3	2	1	0

Please rate this employee on each of the characteristics listed below. ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
21. Use of tools and equipment	5	4	3	2	1	0
22. Selection and care of space, materials, and supplies	5	4	3	2	1	0
23. Ability to work with co-workers	5	4	3	2	1	0
24. Accepting advice and supervision	5	4	3	2	1	0
25. Working in a leadership role when applicable	5	4	3	2	1	0
26. Understanding the value and importance of work	5	4	3	2	1	0
27. Prompt and dependable in attendance	5	4	3	2	1	0
28. Willing to accept and perform tasks	5	4	3	2	1	0
29. Ability to plan and direct own work	5	4	3	2	1	0
30. Ability to make sound decisions	5	4	3	2	1	0
31. Shows consideration and kindness towards others	5	4	3	2	1	0
32. Neat, clean, and appropriate appearance	5	4	3	2	1	0
33. Flexibility to accept change	5	4	3	2	1	0
34. Ability to learn new job tasks	5	4	3	2	1	0

35. What is your overall rating of this individual's occupational competence as it relates to his/her job?

(5) ____ Very Good
(4) ____ Good
(3) ____ Acceptable
(2) ____ Poor
(1) ____ Very Poor

36. If the opportunity should arise, would you promote this employee?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

37. When hiring recent high school graduates, would you prefer to hire persons who have had high school vocational training?

(3) ____ A good deal of preference
(2) ____ Some preference
(1) ____ No preference

38. In which of the following ways does your business work with secondary schools to support education? *(Please check all that apply)*

(1) ____ Suggesting new vocational courses
(2) ____ Recommending equipment and materials to be used
(3) ____ Providing equipment/materials/donations
(4) ____ Providing facilities
(5) ____ Providing vocational students with work experience
(6) ____ Serving on advisory committees
(7) ____ Providing teachers with work experience
(8) ____ Releasing employees to teach vocational courses
(9) ____ Partnerships

Please comment on:

(1) Additional skills you feel are needed by graduates

____

____

(2) How high school vocational programs could be improved

____

____

(3) What new technologies are coming into your work place

____

____

Thank you for responding.

BEST COPY AVAILABLE

APPENDIX D

MODULE EVALUATION FORMS

- Project Staff Form
- Teacher Form
- Student Form

HI TECH TRAINING PROJECT
PROJECT STAFF
MODULE EVALUATION FORM

MODULE NAME ____

Scale: 1 - Needs Improvement
2 - Satisfactory
3 - Very Good

Dimension	Rating	Comments
1. TITLE: The module contains a name.	1 2 3	
2. DESCRIPTION: Information is provided as to where the module fits in a sequence of a unit/task/course	1 2 3	
3. OBJECTIVES: A. Module objective is stated.	1 2 3	
B. Specific objectives are listed.	1 2 3	
4. CONTENT OUTLINE: first, second and third order outline of the content is presented	1 2 3	
5. ACTIVITIES: Are identified which will help students learn the content	1 2 3	
6. RESOURCES: A variety is listed which will help students/teachers accomplish objective.	1 2 3	
7. EVALUATION: A. Evaluation criteria identified.	1 2 3	
B. Evaluation procedures given	1 2 3	

ADDITIONAL COMMENTS:

TEACHER EVALUATION
HIGH TECH MODULE

[illegible]

TEACHER ______ DATE ______

MODULE TITLE ______

DATE(s) USED ______ CLASS(es) ______

TIME REQUIRED TO COMPLETE THE MODULE (MINUTES) ______

Directions: Please list the information requested above. Then read each statement below and respond based on your experiences with the module. Use the following responses.

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

If you have any comments, write them by the statements or at the end of the form.

	Responses/Comments				
EVALUATION STATEMENTS	SD 1	D 2	U 3	A 4	SA 5
MODULE					
The Module was easy to use	1	2	3	4	5
The Module was complete	1	2	3	4	5
3. Objectives were clear	1	2	3	4	5
4. Activities in the Module were effective in stimulating learning	1	2	3	4	5
5. Audio visual aids and/or resource materials were effective	1	2	3	4	5
6. I had the classroom and lab equipment required to effectively use this Module	1	2	3	4	5
7. Evaluation procedures were effective	1	2	3	4	5
8. This Module introduced new content, concepts, skills, etc. in my class	1	2	3	4	5
9. The knowledge and/or skills students learned are relevant to the needs and trends in industry	1	2	3	4	5
10. This Module fit well with the rest of my course content	1	2	3	4	5

STUDENT EVALUATION FORM

SCHOOL ______________________________ DATE ______________

CLASS ______________________________ MODULE ______________

Directions: Read the statements on the left. Use your experiences in the unit just completed in class to answer each statement. Use the following responses. There is space for comments at the end.

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

EVALUATION STATEMENTS	Responses SD 1	D 2	U 3	A 4	SA 5
1 I liked this learning unit......................	1	2	3	4	5
2 I learned some useful things....................	1	2	3	4	5
3. The learning activities were interesting........	1	2	3	4	5
4. The activities, tasks, and/or assignments were helpful..................................	1	2	3	4	5
5. I learned some things that will be useful in the future.................................	1	2	3	4	5
6. I learned some new things......................	1	2	3	4	5

7. What was the most important thing you learned?

8. How could this unit be improved?

HIGH-TECHNOLOGY TRAINING MODEL

Envisioning Process

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 51
Purpose 52
Objectives. 52
Background 53
Training Process Continuum. 54
Envisioning Process 58
Facilitating Change 68
References 77

LIST OF FIGURES

Figure 1. Training Process Continuum. 56

ENVISION

Introduction

It takes a concerted effort for schools to keep current with the technology and systems used in business and industry. Vocational and technical programs have a special challenge to develop the requisite competencies, skills and knowledge, needed to adopt to and utilize the technology that businesses and industries have purchased or plan to purchase in the predictable future. Educators are also vitally concerned with the future. In many instances it may be two to four years before their students have an opportunity to use the competencies and skills in the workplace. When a vocational or technical program is singularly based on competencies that are being phased out in the world of work, students have a difficult time finding employment and, when they do, their initial productivity is less than expected, based on the level of training.

Educators need techniques and processes that will allow them to look ahead, to envision what will be in the workplace two, five, and ten years in advance. The ten year picture may be somewhat fuzzy, however, educators need to be able to look ahead two and five years with some clarity. The people involved with training in business and industry also need techniques that will allow them to look ahead at the types of skills and competencies required to keep their companies competitive in a world marketplace. The traditional task analysis techniques provide an appropriate way to determine the skill and knowledge content of jobs that are relatively stable. However, when the skill content of a job is changing, the task analysis process always lags the actual training needs. In other words, it cannot predict what competencies and knowledge are needed to perform on a job that does not exist at this point in time.

This fact became evident when the High-Technology Training Model Project staff members worked with a large company that was developing a new production model and a new production system. Through adaptation and experimentation with a combination of job analysis and futurist techniques, project staff members were able to develop a process that worked successfully. No doubt, this process will need to be refined as it is applied in other settings.

This module will share the envision process with the reader. Readers are encouraged to apply and modify it as necessary to fit their particular applications.

Purpose

The purpose of this module is to present several techniques and processes that can be used to envision the competencies and knowledge needed in jobs that are evolving and changing.

Objectives

This project will meet the following objectives:

1. Identify situations in which the envision process should be used.
2. Describe how the selection of a proven system can provide the framework for identifying training needs.

3. Describe techniques that can be used to create a vision that can be used to transform an organization.

4. Identify ways to overcome reluctance to change.

Background

This module is based on the experiences of staff members on the High-Technology Training Model Project. It grew out of the realization that traditional needs assessment techniques do not work effectively when the production systems, jobs, and/or management systems used in a company are in transition. Often when companies realize they need to change, they feel there is a need to re-train their employees. However, it is difficult to identify the type of re-training required. This situation also applies to educational institutions.

In two companies the project assisted management staff members who wanted to adapt and employ proven production systems. Given the nature of their product lines, this approach appeared to be appropriate. The major challenges were to select the appropriate production system and make a commitment to implementing it. In a third company, a new product line and a new automated production system were being developed. In this setting, an existing system was not available to guide the work of the training developer.

Project staff worked with trainers and supervisors in all three companies. In the first two companies, the adoption or deployment of an existing system provided an appropriate framework for designing training and identifying the types of competencies and knowledge needed. In the third company, more unique techniques and processes had to be devised.

Another facet of training in business and industry that needs to be considered is relevancy. Most managers, supervisors and line employees want to see the relevancy of the training they are taking. Based on our experiences in these companies, it was apparent that unless the training was relevant, employees often lost interest and in some cases quit attending. When training programs are developed to prepare employees for future tasks and roles, it is important to communicate how these will fit into the new types of jobs and tasks envisioned in the company. This process will also be important in school programs that enroll students who wish to have relevant instruction and want to know how the contents of their learning activities relate to what they will be doing in the world of work.

The techniques and processes that follow are based on a variety of experiences in assisting schools and companies in identifying educational and training needs. Each technique has strong and weak points. You will need to review them and select the most appropriate one for your needs.

Training Process Continuum

The stages in the training process continuum are depicted in Figure 1. Each of the stages has a purpose and value. The starting point, perspective and outcomes for each stage vary.

The four stages are show in a hierarchical sequence. This was done to communicate that these stages do have an interrelationship. For example, the knowledge acquired through short-term, very focused training, in the find and fix stage can be used to design longer range training programs for the performance improvement stage. These connections will be further illustrated as each stage is described.

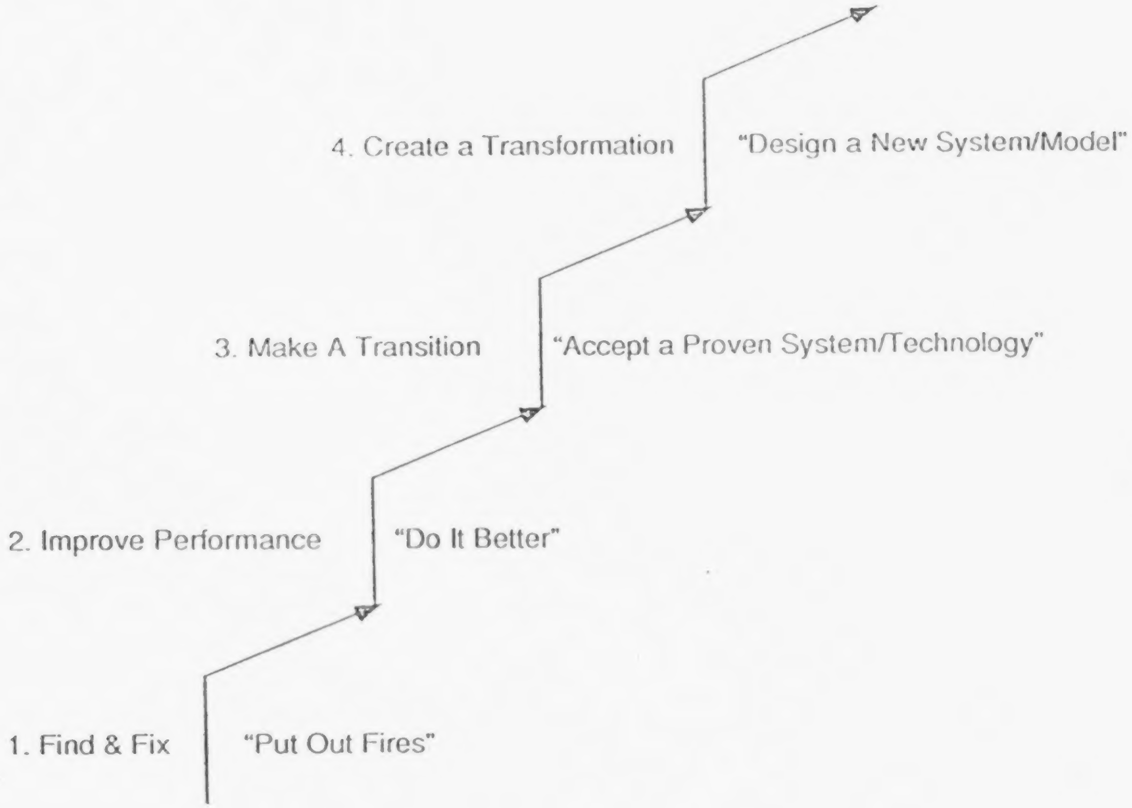
Find and Fix

Training and education in the find and fix stage is done to solve immediate problems. Often this is described as putting out fires. The training is focused on specific problems and is designed to provide the best program under the given time and resource constraints. In some respects this can be viewed as Just in Time (JIT) training. It does help to solve immediate problems and improve performance. Also, it can provide knowledge for a systematic training program. However, primary emphasis on this approach delays the development of an organized and systematic training program. The information gained in this phase needs to be used in designing a more comprehensive training program.

Improve Performance

The improved performance stage emphasizes a systematic training program focused on developing all employees' skills and competencies. The goal is to improve the efficiency and

Figure 1: Training Process Continuum


4. Create a Transformation
"Design a New System/Model"
3. Make A Transition
"Accept a Proven System/Technology"
2. Improve Performance
"Do It Better"
1. Find & Fix
"Put Out Fires"

effectiveness of the organization. The training program is designed within the current technology and systems used by the company. A task analysis process is used to identify the skill and knowledge levels needed by various groups of employees. In addition, feedback from a quality program can help to identify product, service and process defects that can be remediated through training and education.

Make A Transition

Frequently a company will find that it's existing technology and systems are not adequate to make it competitive. There is a need to make a transition to new technologies and systems. In the make a transition stage, the emphasis is on selecting proven technology and systems to implement in the company. One of the best examples of this during recent years has been the adoption of quality programs in a large number of companies in the United States. Although a major change is being made within the company, a proven framework for this change exists in other companies. In other words, the technology and systems have been proven to be functional in a variety of other settings. The major challenge to the company involved in a transition is to select the appropriate technology and system(s), prepare its employees to use them, and provide appropriate support for the infusion of the new technology/system. Since the technology and systems are known, a task analysis approach can be used to identify the types of skills and knowledge needed to manage and operate the system. This information can then be used to design the training program.

In addition to training on these skills and knowledges, attention will need to be given to the change process and the types of orientation/training activities required to facilitate change.

Create A Transformation

The fourth level, create a transformation, is utilized when an organization must make significant changes to remain competitive. At this stage, an existing system is not available. The company must study its needs, monitor new developments and construct a valid system. The following sections describe in more detail techniques that can be used in the envisioning process.

Envisioning Process

The envisioning process requires the input of information from a variety of sources, processes for creatively analyzing this information, and consideration of the organization's culture. Each of these will be described in more detail in the sections that follow.

Information for Envisioning

Two types of information are used in the envisioning process. First, one needs to be aware of technological advances and the development of new management systems. Second, a knowledge of the specific company, plant site, or organization within which the transformation will take place is required. A scanning process is one technique that can be used to acquire the first type of information. Processes for collecting organizational information are described in a later section.

Scanning Techniques

The scanning techniques should allow one to tap a variety of resources and sources of information. As many staff members as possible should be involved in the scanning. For instance, each might be responsible for monitoring the technological trends reported in the literature they read and at the conferences they attend. This would provide a multiplier effect and allow the organization to have a broader perspective than what would be attainable through having just one person responsible for scanning. Periodically, the results of the scanning activities should be discussed in staff meetings or other small group sessions and synthesized to identify potential changes. If this is systematically done it would allow one to identify trends and pending new developments. Several techniques that can be employed to scan new developments are described below.

Interacting with Business and Industry.

One way for educators to monitor changes in technology and new systems implemented in business and industry is to maintain a close and continuous contact with people in area companies. One department in a company that has first hand knowledge of training needs and the new competencies required is the training department. Some companies are expanding this function and calling it human resource development (HRD). In either case, the people involved in these departments/units are concerned about identifying the competencies needed to operate the technology used in the company and effective ways to develop these competencies. Many small and medium sized companies have not appointed someone to the responsibility of training director or human resource development director. In a small company this responsibility is sometimes retained by the president or is given to a manager. In other instances, small companies are not systematically involved in identifying their skill and competency requirements or in training.

Area meetings of professional organizations provide an excellent opportunity to network with training professionals, managers and technical staff. Presenters at these meetings usually discuss innovative technology and systems. National conferences provide a expanded opportunity to interact and learn more about new developments. Another way for educators to interact with B/I is to visit and interview employers in area companies. This process and sample interview questions are given in the module on B/I interviews. Advisory Committees can be used as another effective way to acquire input form B/I.

Published Materials.

Newspapers probably have the shortest lag time between the advent of a new technology/system and the time when information appears in print on this development. Usually newspapers do not give an indepth treatment of new developments and systems. Also, some papers have better science, technology and trends sections than others. Newspapers are, however, useful in providing early signals on the development and deployment of new technology and systems.

Several trend letters are published for various audiences. These are often useful in monitoring new developments.

It takes longer for an article to be developed and published in a journal than in a newspaper. However, journal articles usually provide more depth and insight into the technology and its applications. Staff members should be responsible for perusing or reading professional journals related to their disciplines. In addition, a review of research journals related to your organization's work should be done. The trends/new developments columns in journals usually contain information that is worthwhile. These columns should be reviewed systematically.

Information in books is usually less current than that available in journals. Books have an advantage in presenting a more indepth presentation on a particular technology or system. More information is provided on the technology/systems and its applications.

All of these published materials can be helpful in monitoring technological, systems and societal trends. It is very difficult for any one person to be able to keep up with all of the information that is published. Therefore, each member of an organization should be given responsibility for monitoring certain types of journals, selected newspapers and specific books. Every four to six weeks, staff members should list and discuss the trends and new developments they have found.

Labor Market Information.

Certain types of labor market information can be useful in identifying new technological developments and systems. The adoption of new technology and systems is often accompanied by the generation of new job titles and/or significant changes in existing jobs. Also, the impacts of new technology may be reflected in a declining number of jobs in some areas. For example, the widespread us of personal computers (PC's) and word processing software has led to the development of word processing jobs and a decrease in the number of typists hired. Federal and state governments produce several documents on a monthly and annual basis that provide summary data on the labor market. These should be scanned on a regular basis to isolate any trends that are occurring.

Another source of information on changing technology and operating systems can be found in the position descriptions posted in professional journals and newspapers. In addition, the types of jobs listed are an indicator of changing technology and the competencies required in the workplace. In the 1950's and 60's keypunch operators and computer programmers were growing in number, now key entry jobs have replaced keypunch operators and computer systems people are preferred to programmers. Often the spread of new technology can be observed in the number of new job titles created and the increasing numbers of fields in which the technology is used. Two contemporary examples of this are computer and laser technologies.

Special studies are frequently conducted by national associations, federal and state governments, and local economic development associations. For example, Profile 21 commissioned by the Society of Manufacturing Engineers identified new roles for the manufacturing engineer and new competencies for this position. These studies are usually stimulated by a changing labor market and a changing skill composition in jobs. Thus, they can be useful in identifying new competencies.

Data From Your Organization

Quality, reliability and production data can be useful in identifying problem areas. The data can be displayed and analyzed using a Pareto Diagrams to identify the most common and costly problems. These problems can then be further analyzed through the use of cause and effect diagrams to identify potential causes related to the problem.

An organization's customers also provide useful information for a company. The customer would be the individual or organization that purchases the organization's services and products. One form of feedback is customer complaints. However, many people do not complain. Instead they switch to a competitor. Therefore, it is important to take a pro-active approach and contact your customers. Interviews and surveys can be effectively used to identify what is being done right and what needs to be changed. These contacts can also be used to obtain information on new products and services the customers would like.

In educational situations, students, graduates and employers are the customers. These people need to be contacted to obtain feedback concerning the quality and relevancy of the educational program(s) under study. Other modules in this handbook describe graduate and employer follow-up studies.

One of the problems often encountered in U.S. companies is the separation between the research and development (R&D), and manufacturing/production functions. This situation is often described as "The R&D Department throwing a new design over the fence to the production department." This approach does not lead to a smooth transition from the design stage to production. However, the solution of this problem is not the prime focus of this module. Instead, the intent is to make the point that information and concepts developed during the R&D, and prototype stages can be useful in developing the vision for the new production system and the type of training required. Trainers need to be actively involved in these early stages.

This conclusion is based on the experiences project staff had with a company that was designing a new product. In addition, the company involved was working on a new production system that was much more automated than the current system. The prototype product was not completely developed and the manufacturing system was still being designed. It was apparent that a task analysis of current jobs would not provide the information needed to design a valid training program for the new production system.

To initiate the design process for the training system, staff members in the prototype lab were asked to envision the type of manufacturing system required. A focus group format was used. Prototype lab staff members were encouraged to be creative. Since the product being developed and the technology involved was confidential, the project researchers were not able to directly participate in this process. However, the company's human resource development staff worked with the prototype lab staff members. HRD staff members reported that the process worked effectively. They were able to develop a vision of the type of production system that would be used and the jobs that would be needed to operate the system. They also indicated that the prototype lab staff members were very excited about being involved in the process and continued to provide suggestions after their meetings.

Although the researchers have not had an opportunity to track the accuracy of the forecast developed, this approach appears to be promising. At the very least it provides a general framework from which the specific manufacturing system can be designed and developed, and facilitates concurrent training program development. Moreover, this approach has the potential to provide parallel planning for the development of the production system and the total training program required for the production system. In addition, it ensures that training an up-front consideration throughout the development process.

Since this envision process is a projection from estimates and somewhat sketchy data, it will be important that as the product and production systems are refined, the human resource development/training staff must continue to monitor the competencies required to effectively operate the evolving systems. This information can then be used to refine and modify the training programs developed. It can also be used to trigger JIT training activities which fill in the gaps in employees' competencies.

Processing the Data

Data from the envision process can be analyzed by an individual or group process. A group process provides an opportunity for additional data inputs and a chance to exchange ideas.

Although there is no system for generating completely accurate predictions of the importance or likelihood of new technology, there are certain characteristics and conditions associated with technologies that are widely accepted as indicators of their importance and influence. When current technologies have been stretched to their maximum, a new technology that has the potential to improve productivity and efficiency has a good chance of being adopted. Computers are a good example. Computers were initially developed and have been upgraded to help people deal with growing volumes of information. Any technology that makes it possible to do things that were not possible before, typically has a major impacts. For instance, the development of the laser facilitated the development of precision cutting, measurement and surgery techniques that were not available before its creation.

Some of the indicators of the importance of a new technological development and its applications are the amount of space devoted to reports and articles on the technology, the pace at which the technology is adopted, and the extent to which it is applied in new fields.

Educators will need to determine or estimate the relevance of a new technology to their programs. Individuals in business or industry need to look at the same technology and determine its relevance for their company. It may be helpful to have a small group of people discuss the technology and its applications. One method, the brainstorming format for example, can be used to identify these implications. After the implications have been discussed, the group can prioritize them and identify the most important ones. An alternative method, the Delphi process, could be used to determine priorities.

At this stage your organization will need to make a decision concerning the new technology. The information may indicate that the technology has not been sufficiently developed to warrant its use at the present time. If this is the case, someone should continue to monitor its development if there appears to be some potential application. If the information analyzed indicates that the new technology has potential value, but more data is needed before a decision to implement can be made, you will need to actively seek more data. A more active process of contacting people who are using the technology can be implemented. This could involve contacting researchers, universities and companies experimenting with the technology; and attending technical conferences. Another approach would be to purchase the technology and experiment with it.

Other approaches that can be used are simulations and scenarios on the applications of the technology. The simulations could be done on computer. Another process that can be used effectively when the technology involves organizations and production systems is role playing. In role playing the information collected in previous steps can be used to define the new system, identify the roles of people in the system, and describe the outputs of the system. Individuals in your organization can then play these roles and determine if the system will be effective, efficient and worth adopting. Experience gained through the role playing can also be used to identify the types of competencies people have to have to manage and operate the new system and the types of changes that will be necessary in the organization.

In almost all of these situations it will be difficult to totally quantify the results. This is where the small group discussion and consensus format is valuable. The group should review the data available and consider the outcomes of inaction, doing nothing, and the potential outcomes of changing to the new technology and/or systems.

Facilitating Change

Frequently individuals and organizations are resistant to change. A variety of factors may cause this. People may not perceive a need to change and thus do not want to invest extra time and effort. In other instances, change may threaten their security. Organizations often do not encourage and reinforce change, as a result, people are reluctant to change.

Whether intentional or not, many organizations are not designed to facilitate change. Innovation is not encouraged or reinforced. The systems and procedures used in many organizations make it difficult and time consuming to change. In other organizations communication channels are long and cluttered with obstacles.

Characteristics of Innovative and Effective Organizations

Fortunately, a number of innovative and effective organizations exist in our country. Peters and Waterman (1982) studied sixty-two companies that were selected based on their high levels profitability and innovativeness. The following characteristics were common to these companies.

1. Action was encouraged. Employees were encouraged to develop solutions to problems and design new products rather than bouncing a problem from one committee to another or one level to another in the company without any result and action.
2. These companies stayed in close touch with their customers and kept informed of their needs and preferences.
3. Small companies were formed within the corporation to encourage independent thinking and to promote entrepreneurship.
4. All of the companies had a great concern for their people. They worked to make them feel that they were a part of the

organization and that their contributions were important.

5. Managers and administrators in effective organizations have hands-on experiences with the organization's essential activities.

6. Effective organizations focus on what they know best.

7. A flat organizational structure is used. There is a focus on teamwork and a minimum of administrative levels.

8. The organizational climate encourages dedication to the primary values of the organization, but innovation and deviations from these values are also excepted.

Modeling

Richard Walton commented that innovation cannot be effective unless it is guided by a vision manifest in a model. A model is a general concept of the future organization and evolves from an understanding of the limitations of traditional organizations and experimentation with alternatives (1985, p.15). Walton noted that three processes were important to innovation: (1) process-sponsorships, (2) consensus, and (3) information. The first process, innovation, requires someone to champion or sponsor the concept or new approach. There is a need to establish the fact that the organization needs to change. The second, consensus, involves gaining the agreement of the various groups and people involved in the systems that will be effected by the change. The third process, the transfer of information, facilitates the development of sponsorship, consensus and construction of an effective model. People in an organization need to know what their competitors are doing, the new technologies that are available and how new systems can be implemented.

Factors Influencing Change

Studies of the change process and organizations that have been innovative provide insights on factors that influence change.

1. Information and Awareness. The individuals and units that will be influenced by change need to be kept informed of the need for change and the potential responses to this need.
2. Team Work. The individuals who will be involved in the change process and affected by it, must be a part of the planning process and fully participate in the activities initiated to create the desired change.
3. Effective communication System. Innovation and change are facilitated by effective communications throughout the organization and across levels in it.
4. Rewards and Reinforcement. The organization must encourage innovation and change through its system of rewards.
5. Organizational Structure and Procedures. The change approval process within an organization must be simple enough to permit the survival of innovative ideas and approaches.
6. Make the Change Process Fun and Interesting. People are much more likely to participate in activities that they find to be interesting and fun.

Information and Awareness.

People are reluctant to become involved in an activity or project unless they have sufficient information about it. They want to know why the activity is needed, how it will be conducted, and the value of the potential outcomes. Several information scanning and activities were described previously in this section. Involvement in these activities will help to keep people informed. They also need to receive adequate information on what is happening in their organization.

Team Work.

The team work concept builds on the first change principle. By being involved, members of an organization will develop a more personalized knowledge of the innovation, their role in it, and the overall goals. Peters and Waterman commented that "those who implement the plans must make the plans (1982, p.31)." Walton (1987) recommended that the people who would be effected by change should develop the change model. Participating in a team also expands individual's perception of the importance of the innovation and his/her role in it. They also have a better idea of the types of commitments that others are making to the process and as a result develop more commitment to the overall plan.

Effective Communication.

An effective communication system which involves all levels of an organization keeps its members well informed and builds trust. An effective communication system also provides timely responses to questions and requests that are developed by team members. This permits planning and implementation of the change process to progress on an orderly schedule.

Rewards and Reinforcements.

Appropriate rewards need to be available to recognize and reinforce innovative behavior. This also means that people who try new approaches and systems must be able to fail without being punished. A wide range of rewards can be used. These range from a simple process of recognizing those who have worked or participated in an innovative project to more complex reward systems that permit people to spin out their won projects or departments. First hand access to the latest information, opportunities to attend conferences and conventions, the changes to expand one's skills and the opportunity to manage one's time are also reinforcing. An effective team leader will identify the actions and conditions that reward and reinforce team members and use these effectively. Before leaving the reward section, it is also appropriate to comment that people should not be rewarded and recognized for maintaining the status quo if innovation is desired.

Organizational Structure.

The organizational structure, policies and procedures can facilitate or be a deterrent innovation. In one company in which the researchers worked, it took more than a year to have a product change order processed and approved. Although the employees in this unit were actively changing processes and characteristics of the product to make it better meet the needs of its customers, they seldom if ever filed a change order. It took so long to process and the procedure was so difficult that they did not feel that it was worth their time. Fortunately the company has a relatively stable work force and has developed a reputation for high quality products and services. However, the product being produces is not quite same one that is described in the design specs. People work harder and are more innovative when the process is fun.

During the High-Technology Training Model Project, staff members worked with educators in secondary and postsecondary school systems and industrial trainers in area companies. These experiences identified several potential problem areas when different types of institutions worked together. The differences in the cultures of the several organizations posed some problems; however, the positive outcomes of the interactions greatly exceeded the magnitude of the problems encountered. All of the participants learned and grew from the experience. Some of the major cultural differences are discussed in the following paragraphs.

The philosophies of organizations vary. The types of goals and emphasis placed on them are obviously different from education to business and industry. However, even across educational organizations there is a difference. In addition, there are differences in the types of strategies and activities that can be used to accomplish these goals. It is important that these differences and commonalties be discussed as organizations initiate a cooperative venture. Once these have been identified, participants will have a better understanding of how each organization operates and where there may be potential conflicts.

The reward systems in organizations also vary. In a company, people are reinforced for developing more efficient production systems and producing products that satisfy customers needs and interests. University professors are rewarded for research conducted and publications. When these two reward systems interacted, we found that people in business and industry were interested in immediate improvements in their production systems and products. They were not concerned about documentation and reports. On the other hand, university staff members were concerned about adequate research designs, appropriate methodology and rigorous research reports. It is obvious that people from the two organizations need to clarify their needs, interests and approaches.

Another organizational condition that causes problems are the work schedules of organizations. companies work on a year around basis with some interlopes in production depending upon demand in the consumer sector. When possible, a company would like to make its changes during a lull or relatively slow period. colleges and universities work around the typical class schedule which'runs from approximately the first of September through the middle of May. There are times during the school year when it is difficult for faculty members to be away from their classrooms and offices. Also, often faculty members have other projects and activities scheduled for break periods and the summer. The scheduling of cooperative projects needs to be carefully done to take into account the typical schedule of each participant.

If these differences are recognized up front, it is much easier to establish a good working relationship. Time must be given to developing an effective working relationship.

References

Kosken, D. K. & Romano, J. D. (1988). Countdown to the future: The manufacturing engineer in the 21st century. Durborn, MI: Society of Manufacturing Engineers.

Nelson, O. (1989). Delphi technique. Menomonie, WI: Center for Vocational, Technical and Adult Education, University of Wisconsin-Stout.

Nelson, O. & Lee, H. (1990). Trends and forecasting workshop (final report). Menomonie, WI: Center for Vocational, Technical and Adult Education, University of Wisconsin-Stout.

Peters, T. J. & Waterman, R. H. (1982). In search of excellence: Lessons for America's best-run companies. New York, Warner Books.

Walton, R. E. (1987). Innovating to compete: Lessons for diffusing and managing change in the workplace. San Francisco, CA: Jossey-Bass.

HIGH-TECHNOLOGY TRAINING MODEL MODULE

Needs Assessment Module

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 80

Purpose 80

Objectives. 80

Needs Assessment 80

Needs Assessment Techniques 83

Summary 86

References. 87

LIST OF FIGURES

Figure 1. Techniques Used in Needs Assessments. 83

Needs Assessment

Introduction

This module discusses the role of the needs assessment process in developing and revising courses, programs and services. Several needs assessment techniques are listed and references given. Procedures for using these techniques are not defined since they are readily available in reference books and manuals.

Purpose

The goal of this module is to describe the general functions of and identify alternative ways to conduct a needs assessment.

Objectives

The objectives of this module are to:

1. Define "need".
2. Describe the role of the needs assessment process in developing training and educational programs.
3. Identify alternative techniques that can be used to complete needs assessments.

Needs Assessment

Definition of Need

A need is the difference between what is and what should be or what ought to be. For example, if technicians can read at the eighth grade level but the technical manuals used in their work are written at the twelfth grade level, there is a need to improve the reading level of these people. The area of need is identified by the types of technical literature that has to be read and the extent of need is determined by the difference between the technicians' current reading level and the level at which they must read.

A needs assessment is used when one wants to design and implement relevant programs and services. The needs assessment process provides information on the client's or customer's needs, interests, and/or desires.

Needs can be identified in several ways. One approach is to do as described in the example above, contrast the difference between the level at which people are performing and the level at which they must perform. In order to do this you must have a clear prescription of the competency level that is required and a valid measure of performance in relation to this standard or level. The organization may already have a set of standards or the envision process described in the envision section can be used to establish the level at which people must perform. As mentioned in that section, a vision can be established by selecting an existing model or creating a new one. An existing model can be used when an organization wants to implement a proven system or technology. For example, an organization that decides to implement a total quality program can select one of several programs that have been effectively used by other companies and organizations. When an innovative or leading edge system is to be implemented, the organization will need to develop its own model. In either case, an effective model will identify what should be.

After the target or required performance level has been identified, this level can be compared with the existing level to determine the type and extent of need. This process works effectively and efficiently in situations where the target levels can be specified in quantative terms. In some situations it is not possible to do this. Thus, some alternative methods for identifying needs are required.

Another approach to identifying needs is to ask people who are involved in the need area to estimate the extent and type of need. To illustrate this, consider people who are working in their first assignments as teachers. They are involved in a new set of experiences and challenges. In most instances, they have not been completely prepared for all of the situations they encounter. If surveyed, they can provide considerable feedback on the types of competencies they need to develop. This process has been successfully used in a number of situations by our Center to identify the competencies needed and the types of education or training required. This process can also be used to identify other types of needs, such as equipment, services, and facilities.

Another way to identify needs is to review the information on problems and mistakes made in an organization. If problems and mistakes are summarized and analyzed, it is possible to identify reoccurring patterns. Pareto Charts are used by some companies to identify the problems that are most common and costly. A Pareto Chart is a graphic summary of the frequency and/or cost of specific types of problems experienced in an organization. The Pareto Chart can be reviewed to identify the most common problems. Once this is done, other techniques can be used to determine the causes of the problems. In this situation the need becomes the actions or the competencies required to eliminate the problems.

In actual practice it may be necessary to use two or more of these techniques in combination. For example, the Pareto Chart could be used to identify the most critical problem or problems. These problems could then be analyzed to isolate the major cause or causes. Once this had been accomplished a quantative or qualitative analysis could be done to identify specific education and training needs.

Needs Assessment Techniques

Several needs assessment techniques are presented in Table 1. The type of needs assessment, its typical applications, and a source for further information are included in the table.

Figure 1: Techniques Used in Needs Assessment

Technique/Description	Applications	References
A. Techniques for Identifying Problems		
Focus Group		
Group interview process that is guided by questions asked by the interviewer. Interactions between group members are an important part of the process.	Very useful for acquiring data on individuals' perceptions, problems and needs.	Morgan (1988)

(Figure cont.)

Nominal Group

Effective process to encourage participation in groups composed of people with diverse backgrounds and experience. Easy to use and usually is productive.	Can be used with employers, employees, teachers, students and/or parents to identify needs and prioritize them.	Moore (1987)

Delphi

Technique utilized to gain consensus and develop projections of future events. A panel of experts is surveyed to generate the projections.	Could be used to project what a job or organization will be like at some point in the future. Can also be employed to identify and obtain consensus on current needs as perceived by a panel of experts.	Nelson (1989)

Systems Analysis

Process used to identify the inputs, processes, outputs, environmental factors and the interactions that are involved in accomplishing a goal.	Used when several factors interact to influence an outcome.	Halfin and Nelson (1987)

B. Techniques for Identifying Causes

Pareto Chart

A Pareto chart graphically identifies the relative magnitude of the six or seven most common problems that occur in a product, service or organization.	Could be utilized to identify the most critical problem(s).	Ishikawa (1976, 42-50)

Cause-Effect Diagram

"Fishbone Chart" is one type. Usually the problem effect being studied is placed on the right-side of the diagram. An arrow is drawn to the problem. This is the cause side of the problem.	The procedure facilitates breaking a problem apart and identifying potential causes.	Ishikawa (1976, 18-28)

(Figure cont.)

Branches are placed on the arrow to indicate potential causes.		

C. Techniques for Identifying Tasks and Competencies

DACUM

Technique that employs a panel of supervisors and employees to identify the tasks required to perform a job. The panel also arranges and sequences related tasks in horizontal arrays called "bands."	Relatively quick way to identify the tasks and level of proficiency required to do a specific job. Works effectively when job content is relatively stable.	Halfin and Nelson (1977)

Task Analysis

Procedure used to identify tasks, their importance, and the level of proficiency required. Interview and/or survey procedures are used to gather the data.	Used to identify the tasks and competency levels required for a specific job. A survey can be used to acquire input from a large number of people. Works effectively when job content is relatively stable.	Zemke and Kramlinger (1985)

D. Techniques for Identifying Individuals' Competencies

Testing and Assessment Processes

Performance measures, written tests, interest inventories, and other data gathering techniques used to determine knowledge, skill, ability, interests, goals, etc.	Use to determine the current or "what is" level of knowledge, proficiency, or interest.	Tenopyr (1987)

Summary

As mentioned in the opening section, need is the difference between what should be and what is. Needs assessment techniques are utilized to identify the what should be, and what is. The difference between the what is and what should be identifies the type and level of need. In some situations it is not easy to identify the what is and what should be. An alternative form of needs assessment requests people to identify where there are differences between what is and what should be and how critical these needs are.

Several needs assessment techniques are identified in the previous pages. These techniques can be used in a variety of settings and situations. No doubt there are other valid techniques as well. The researcher or program developer will have to identify and select the most effective and efficient technique for a given situation.

In some situations it may be necessary to use more than one technique. For example, a Pareto Chart and analysis will disclose the most critical problems but will not identify causes. To do this, it may be necessary to use a Cause-Effect Diagram, or do a systems analysis. If these techniques identify inadequate or inappropriate employee competencies as one cause of the problem, a task analysis or DACUM process would need to be used.

References

Allen, E. L. [Ed] (1990). ASTD Trainer's Toolkit: Needs Assessment Instruments. Alexandria, VA: American Society for Training and Development.

Ishikawa, K. (1976). Guide to Quality Control. Tokyo: Asian Productivity Organization.

Morgan, D. L. (1988). Focus Groups as Qualitative Research. Beverly Hills: Sage Publications, Inc.

Tenopyr, M. L. (1987). Testing in Training and Development Handbook. Robert L. Cray, Editor. New York: McGraw-Hill Book company.

Moore, C. M. (1987). Group Techniques for Idea Building. Newbury Park, CA: Sage Publications, Inc.

Nelson, O. (1989). Delphi Technique. Menomonie, WI: Center for Vocational, Technical and Adult Education, UW-Stout.

Halfin, H. H. and Nelson, O. (1987). Preparing and Presenting the Technical Research Proposal, in Conducting Technical Research. Edited by Everett Israel and R. Thomas Wright. 36th Yearbook, Council on Technology Teacher Education. Mission Hills, CA: Glenco Publishing Company.

Halfin, H. and Nelson, O. (1977). DACUM Gives Direction. The Wisconsin Vocational Educator. 1, (4)

Mager, R. F. and Beach, K. M. (1967). Developing Vocational Instruction. Belmont, CA: Fearon Publishers.

Zemke, R. and Kramlinger, T. (1985). Figuring Things Out. Reading, MA: Addison-Wesley Publishing Company, Inc.

HIGH-TECHNOLOGY TRAINING
MODEL MODULE

Planning and Conducting A Statewide or Regional Survey of Businesses and Industries

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
J. Timothy Mero, Orville Nelson, and James P. Breen
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction 90

Purpose. 90

Objectives 90

Value of Statewide and Regional Surveys of Businesses and Industries 91

Planning and Conducting a Statewide or Regional Survey of Businesses and Industries 92

Mail Surveys 94

Telephone Survey 101

Data Analysis 102

Disseminate Results. 105

Implement Changes. 105

References 107

Appendices

A. Business/Industry Training Survey 108

B. Questionnaire, Telephone Follow-Up of Non-Respondents . .112

C. Basic Descriptive Statistics 114

D. Sample Presentation Visuals 117

PLANNING AND CONDUCTING A STATEWIDE AND REGIONAL SURVEY OF BUSINESSES AND INDUSTRIES

Introduction

This module describes the procedures and actions required to plan and conduct a statewide or regional survey of businesses and industries. In some instances, the reader is referred to other modules, such as Selecting Appropriate Sampling Techniques that are used in planning and conducting the survey. The body of this module describes the steps and procedures needed to plan and complete a mail survey. In some instances, additional details have been included in appendices. Where this is done, the reader will be referred to the appropriate appendix.

Purpose

The purpose of this module is to provide the information, instructions, and procedures required to design and conduct an effective statewide or regional survey of businesses and industries.

Objectives

The objectives of this module are:

1. Identify the situations in which a survey of businesses and industries is an appropriate technique to acquire data.
2. Provide information and procedures that will allow the reader to plan and conduct an effective statewide or regional survey of businesses and industries.
3. Provide information and instructions on how to develop a valid survey instrument.

4. Describe how to select a valid sample.

5. Describe the advantages and disadvantages associated with various survey procedures.

6. Suggest how to use the survey results.

Value of Statewide and Regional Surveys of Business and Industry

The purpose of a statewide or regional survey of business and industry is to obtain pertinent input from employers and employees for the improvement of educational programs and services.

When administrators and program directors/managers need information for program assessment, evaluation and decision making, they usually go to the source. They go out into the state or region they service to get information because that is the best source for the required information. Although other means of going to the source are available, a frequently used approach is the use of a mailed survey instrument or questionnaire. Surveys are a primary source of information. While surveys provide timely information in response to specific research questions, they are costly and provide less control. The administrator or manager conducting the survey is dependent upon the respondent's ability and willingness to provide accurate information.

If there is any intent to infer anything about the population from the data derived from the collected survey information, appropriate sampling techniques (see sampling module: Selecting Appropriate Sampling Techniques), must be used.

Planning and Conducting a Statewide or Regional Survey of Business and Industries

The starting point in the development of a statewide or regional survey of businesses and industries is to identify the objectives for the study. The best way to do this is to determine the types of information needed to make the curriculum, instructional, and general program decisions being addressed. This information can be obtained by asking teachers, administrators, school board members, advisory group members, and others concerned with your school system what information they need to have. This can be accomplished by interviewing samples of these people or by using focus-group sessions. The focus-group technique is described in the module, Working With Small Groups. Another useful technique is to record the information needed as you do program and curriculum revisions.

There are three basic techniques for conducting surveys: (1)mail, (2)telephone, and (3)interview. Each of these techniques has its inherent strengths and weaknesses as an information-gathering process. The criteria for the selection of one of these information-gathering techniques over another are the type and amount of data desired, and the cost of the information-gathering process. This module will be limited to mail and telephone surveys. For the purpose of this High-Technology Training Model Handbook, interviews will be addressed separately since they can serve very specific objectives directed at the interviewers.

The administrator/manager conducting the survey may wish to get hard data or knowledge from the respondents. An example might include the number of employees by occupation, products produced or services provided, production techniques, and specific processes (production and/or information handling) used. The statewide survey of businesses and industries conducted as part of the High-Technology Training Model Project addressed such topics as the types of business, the organizational structure (single site or multiple site), and the number of employees. Attitudinal or soft/abstract data is a second type of meaningful information that includes the interest, opinion, and feelings of the respondents.

A third kind of data is behavioral, and would include past, present, and intended behavior. Again, the High Technology Training Model Project's statewide business and industry survey sought to get the respondents' opinions as to the annual frequency with which specific areas of high-technology oriented training were provided and the types of assistance or help they could use in planning, conducting and managing their training/educational programs.

The final major type of data or information sought in surveys, referred to as demographics, includes characteristics of the respondents which can be used to tie the collected information to the general population.

2

Mail Surveys

Among the most widely used information-collection techniques, mail surveys are relatively low cost and can be self-administered. Appendix A is the questionnaire used for the statewide survey of businesses and industries conducted as part of the High-Technology Training Model Project.

Advantages

Although the time required to collect data makes mail surveys less desirable for specific applications, they do have matched advantages.

1. Mail surveys provide the respondent a high degree of anonymity which may be necessary for the collection of potentially embarrassing or sensitive information.
2. Geographic dispersion and/or the accessibility of the information sources may require the use of mailed survey questionnaires.
3. Mail surveys are generally cheaper than telephone or personal interviews.

Questionnaire Construction

The construction of the survey form or questionnaire is much more critical for mail surveys than telephone interviews. Once printed and mailed, the questionnaire must clearly convey to each respondent what each question really means. In a questionnaire which provides structured responses (multiple choice or scaled ratings) as apposed to space for open-ended responses, the provided choices should encompass all possible answers to reflect the respondent's response without ambiguity.

With no simple rules that assure the development of a good questionnaire, Fay and Wallace (1987) identify the following 11 problem areas frequently associated with mail surveys. Consideration and awareness of these problems should help one avoid developing or using a problemed questionnaire.

1. Vocabulary. The vocabulary used must be appropriate for the target audience. The emphasis should be simpler, more explicit terms as opposed to difficult ones. Acronyms and technical terms should be avoided.

2. Predictable Questions. Avoid asking specifically worded questions to which you can predict the respondent's answer or which can be answered as Yes or No. Such questions do not provide meaningful information.

3. Unanswerable Questions. Questions the respondents could not be expected to have the knowledge to answered. You could ask manufacturing firms in general terms the dollar value of their annual production of "X" product but it may be inappropriate to ask what percentage of the total state production of "X" product their firm produces.

4. Multiple Questions. Don't ask respondents two or more questions in a single sentence. Each question asked must be limited to one item or concept.

5. Ambiguous Terminology. If one asked an employer how satisfied they are with graduates from their institution the question is ambiguous. Is the question referring to their

current performance, entry level knowledge, work ethics, specific technical skills, or is the question referring to the time required for them to reach the required performance levels.

6. Sufficient Space. If respondents are asked to express their opinion in response to open-ended questions, it would be inappropriate to only give space for a few words. This also holds true for multiple choice questions when no space is provided after the choice of other (please specify).

7. Nonbipolar Adjectives. Bipolar adjectives are often used when it is desirable to have respondents describe products or attitudes; for example "Overall how would you rate the satisfaction your job provides? No satisfaction . . . Totally satisfying." The problem arises when the adjectives used, which are to represent opposite ends of the spectrum are not clearly related. If fun was substituted for no satisfaction, the respondent can not provide a reliable response.

8. Poor Choice Sets for Structured Answers. A variety of shortcomings are possible in the answer sets used to develop a questionnaire:

a. Omission of the choice other or don't know is a frequent failure.

b. Inclusive sets must exhaust all possibilities while preventing multiple selections. For example; if respondents were asked to indicate the number of employees with the following sets 5-20 employees, 21-50 employees, 50-99 employees, and 100 or more employees; respondents would not have been allowed to answer less than five employees, and a respondent with exactly 50 employees could be in either of two categories (21-50 or 50-99).

9. Improper Forced Choice: A frequent approach in questionnaire development is to force respondents to choose one alternative in a study of job training requirements (i.e., there are apprenticeship, associate degree, and certification requirements). A properly developed questionnaire should also provide the respondents the probability of identifying a job requirement category of None or Other (Specify).

10. Assumptions about Respondents. Asking "Which of the following skills should be stressed for our graduates?" makes the assumption that the respondents wants graduates with specific skills. A "None" or "Other (Specify)" category should be provided.

11. The Interesting Question. One of the greatest failing of those who develop questionnaires is the asking of the interesting but unneeded questions. If such demographic question such as the age or political preference of the respondent is an essential element, it should be asked. Fay and Wallace, (1987) suggest an acid test. Layout the intended use to be made for each piece of data to be collected. If this can not be easily done, one should consider dropping the question.

Response

Even though the low cost of mailed surveys is an advantage, the response rates are typically low. It is statistically important to do everything possible to increase the response rate

107

to preclude the possibility of missing data. We note in passing some of the devices used, with varying degrees of success in an effort to increase the response rate. There are no guarantees but one might consider one or all of the following guidelines based on Fay and Wallace (1987).

1. Preliminary Letter. Use of a preliminary letter stressing the importance of the survey, benefits, and detailing intended use to which the information will be put.

2. Sponsorship. Presumably the neutrality of the sponsor may legitimatize the request for information.

3. Cover Letter. The questionnaire itself should be accompanied by a cover letter briefly describing the questionnaire and the importance of response. The cover letter must contain any administrative instructions and assurances which are necessary. Items normally included would direct the respondent to use the stamped, self-address envelope provided; and assurance of anonymity.

4. Mail Type. The manner in which the mail is used, the mail type, may be a critical element. Are stamps or metered mail to be used? Will the envelopes have typed addresses or will stick-on labels be used?

5. Rewards. Many market survey experts inclose a small amount of cash #.25 to #1.00 with the questionnaires. When the results may be of interest to the respondents, such an offering may increase response rates.

6. Anonymity. The sensitivity of the information requested

will dilute the importance. Anonymity must be quaranteed unless permission is requested and obtained to disclose any information on individual respondents.

7. Format. Neatness, clarity, and ease of completing are important. Fay and Wallace point out that content and not form seems to be the key factor.

8. Structure of Content. Generally the key appears to be; (a)initially grab interest, (b)initially avoid sensitive or difficult questions, and (c)ask for demographics last.

9. The style of questions is reported to affect response rate when the questions come up against respondent bias.

Follow-Up of Non-Respondents

Mail Follow-Up.

One cannot be content with a single mailing to respondents. If respondents put the questionnaire aside, a reminder in the form of a second letter asking for cooperation is usually sufficient. It is possible that the original questionnaire was never received. It might be appropriate therefore to include a questionnaire if a second follow-up letter is necessary. If copies of the questionnaire are included in a follow-up mailing, one runs the risk of having some respondents sending in two or more copies of the questionnaire. To preclude such a problems, some researchers code questionnaires. The procedure used with the surveys conducted as part of the High-Technology Training Module Projects included the use of different box numbers in the return address. While it may be possible to identify individual respondents, there was no motivation to do so.

Telephonic Follow-Up of Non-Respondents.

If the regular follow-up procedures of non-respondents does not net a high enough return rate--usually 70 percent or higher--at some point it may be more productive to select a random sample of non-respondents and try to contact them by phone. If there is a time constraint, or if it will be extremely costly to contact these non-respondents by phone, a smaller sample could be used. The original survey should provide the base set of questions used in the telephone survey. It may be necessary to reduce this set of questions in order to make it fit within the length of time that is appropriate for a telephone interview (10-15 minutes). If that is the case, select the most critical questions. Information from the telephone interviews should be processed separately. This will allow you to contrast the results from the follow-up of non-respondents with the results from those who completed their mail surveys. If the results are similar, you can generalize your results to the entire population surveyed. If they are significantly different, you will need to adjust the outcomes in order to make them reflect the characteristics and feelings of the entire population.

Appendix B is a copy of the questionnaire used for the telephone follow-up of non-respondents as part of the High-Technology Training Model Project's statewide survey of businesses and industries.

Telephone Survey

The popularity of telephone surveys has increased with the with the lower relative cost and increased distribution of services made available with WATTS lines.

The interaction afforded between the interviewer and the interviewee provide marked advantages. First, the speed with which data may be gathered; second, flexibility; third, improved response rate for sensitive questions; fourth, the timing and sequencing of questions can be controlled, and fifth, clarification of responses can be obtained.

Questionnaire Construction

The telephone questionnaire, as in the case of the mail survey, must be pretested. Any problem that arises during the pretest or the actual telephone survey itself, can be used to refine the remaining interviews. Such modification should be well documented to facilitate their discussion in reporting the results.

Conduct of the Survey

The interviewers must be well trained to conduct the interview. The interviewer must be polite, intelligible, and neutral to the survey topics. Interviewers can be easily monitored by supervisors. A number of references are available to assist in the preparation and conduct of telephone surveys.

Data Analysis

Editing

Before analysis of the data received in the survey can begin, it must be edited and entered. As Fay and Wallace (1987) noted, no matter how well the questionnaire is laid out, or how clear the instructions, some unexplainable results will be received. Rules must be established in the early planning concerning three groups of problem responses; (a)returned questionnaires with missing data, or unanswered questions, (b)returned questionnaires with obviously incorrect, or nonsensical responses, and (c)open-ended responses. A major set of rules (or protocols) must be developed which will guide the coding of responses if a statistical analysis is planned.

Entered Data

The data analysis to be used must be based on the study's objectives. In some instances, the study's objectives will require comparisons. For example, an objective concerned with identifying responses by industry/business type will require a breakout by industry. Statistically, this is referred to as cross-tabulating. This will require pre-planned coding for data entry and processing. Many statistical programs are available for data analysis with this capacity. The following two points should be considered.

1. Individuals responsible for data analysis must ensure that the available software to be used will have the required capacity.

2. The data analyst should also be asked to jointly review the printouts.

Analysis of Data

A basic statistics book should be consulted for more indepth information on these statistics and to explore a wide variety of additional statistics available. One should consider consult with a person who specializes in statistical analysis. This individual can quickly suggest the appropriate types of statistics and statistical analyses that would be appropriate for your objectives. The statistical analyses used should be understood by your audience and appropriate for the data to be analyzed. It may be necessary for you to have more sophisticated analyses run to address specific objectives of the survey.

Appendix C provides a brief explanation of the basic types of statistics which may be appropriate for explaining the various types of data collected in your study. Statistics explained include the mean, median, made, range, and standard deviation.

Write Report

Two major factors need to be considered when developing the report or reports from the business and industry survey. First, what are the characteristics and information needs of the audience(s) that will receive the report? Second, what are the objectives or purpose for undertaking the business and industry survey?

In most situations, there will be several audiences that will have an interest in the survey results. Administrators, teachers, advisory committee members, local students, and state and regional educational agencies are typical audiences for a business and industry survey. There is probably a core of information that will be of interest to most, if not all, of the audiences. Also, there will be some pieces of information that will have special value to specific groups. Before writing any reports, it would be a good idea to look at each of the potential audiences and identify their primary interests and the types of information they can process most readily. After this is done, a specific audience can be selected and the report writing can be initiated.

Many audiences are concerned about the outcomes of the study and are not as interested in the details on how the study was conducted. For these audiences, report the major outcomes first. Place those items of greatest interest first in the report. Write in a conversational style. A paragraph or two at the end of the report can be devoted to some of the major details of how the survey was conducted and who was involved in the survey.

You will probably need to do a more formal report of the results also. The formal report should contain the following sections: (a) Cover Page, (b) Abstract, (c) Table of Contents, (d) Part I - Purpose and Objectives, (e) Part II - Review of Previous Research, (f) Part III - Survey Methodology, (g) Part IV - Findings (Results), (h) Part V - Conclusions and Recommendations, (i) References and (j) Appendices.

Disseminate Results

Dissemination of the results should be made to groups and individuals who could benefit by learning more about the results of the survey. Where possible, presentations should be made to interested groups. Visual aids that present key results are also helpful. A brief handout that contains the major results presented provides an effective supplement to the presentation. (See Appendix D for sample visuals). Be sure to share the results with teachers, counselors and administrators. Also, some of the results may be relevant to current students. Use your creativity to identify dissemination strategies that will effectively reach people who need to know about your programs. Do not be afraid to try something different.

Implement Changes

One of the most effective ways of implementing change is to involve the people who will need to change and make changes in the process of identifying what modifications need to be made in existing courses, programs and services.

Careful attention should be given to the factors and conditions that motivate change. Behaviors that are critical to the change process need to be reinforced. For instance, interest in changing technology could be reinforced with travel funds to visit area industries that are implementing new technology, attend conferences that present new technology, and/or visit school programs that have developed new curriculums.

After your staff has had an opportunity to review the results of the business and industry survey, they should be involved in discussion groups to identify needs and priorities. Once this has been completed, they can help establish objectives and select strategies to accomplish these objectives.

Resources are also an important part of change. Many good ideas for new programs have been stymied by the lack of resources to implement them. Additional funding is helpful; however, expanding access to community resources can facilitate change. A variety of businesses, industries, and individual talents can be tapped with little or no cost. Talk with local business and industry people to determine how they will help your school.

Often the plan for change gets hung up with the barriers. It is important to identify the objectives, where you need to be, for your programs. After this has been done, brainstorm ways to achieve those goals. Do not let the barriers or problems interfere with the brainstorming process. They can always be factored into your planning later.

References

Bartz, A.E. (1971). Basic descriptive statistics. 4th Ed. Minneapolis: Burgess Publishing Co.

Gay, L.R. (1981). Educational research: Competencies for analysis and application. Columbus: Merrill Publishing Co.

Dillman, D.A. (1978). Mail and telephone surveys: The total design method. New York: Wiley.

Fay, C.H. and Wallace, M.J., Jr. (1987) Research-based decisions. New York: Random House.

Fink, A. and Kosecoff, J. (1985). How to conduct surveys: A step-by-step guide. Newbury Park, CA: Sage Publications.

Frey, J.H. (1989). Survey research by telephone. Newbury park, CA: Sage Publications.

Warwick, D.P. and Lininger, C.A. (1975). The sample survey: Theory and practice. New York: McGraw-Hill Book Co.

APPENDIX A

Business/Industry Training Survey

CVTAE
CENTER FOR VOCATIONAL, TECHNICAL AND ADULT EDUCATION
715-232-1382

UNIVERSITY OF WISCONSIN
STOUT
MENOMONIE WISCONSIN 54751

July 27, 1989

Dear Colleague:

As of this date we have not received your Business/Industry Training Survey. Enclosed we have included another copy of this survey. your experiences and perceptions will provide valuable input into our research project. Please take ten minutes of your time to complete the survey and return it to us by August 7, 1989.

New technology skills and competencies in our work force have created a need for improved educational and training programs at all levels. Information on the types of training you and your company are currently doing and planning for will be very helpful in identifying new content for post-secondary and secondary education programs. your responses will also help to identify areas in which Wisconsin's vocational-technical colleges and universities can help meet your training needs. The survey also provides an opportunity for you to identify the types of assistance that would be helpful to you in providing training for your workers and any training related problems your company may be experiencing.

The results of this survey will be used in developing a training system model that focuses on helping companies identify their training needs and determining the new competencies which should be included in post-secondary and secondary educational programs.

All responses will be kept anonymous. Responses will be analyzed by computer and summary tables prepared for our reports.

If you would like to have a copy of the results of this survey and more information on the High-Tech Project, there is space for you to place your name and address at the end of the survey instrument, or you may send your name and address in a separate letter.

Your participation in this research effort is sincerely appreciated.

Sincerely yours,

Orville Nelson, Director
High-Tech Training Project
CVTAE, UW-Stout
218 Applied Arts Building
Menomonie, WI 54751

Tim Mero, Research Associate
High-Tech Training Project
CVTAE, UW-Stout
218 Applied Arts Building
Menomonie, WI 54751

UNIVERSITY OF WISCONSIN STOUT IS AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION UNIVERSITY

CVTAE/UW-STOUT BUSINESS/INDUSTRY TRAINING SURVEY 5/89
7321

Please answer the following questions and statements as they relate to your companies' training activities and needs.

1-36. A list of training areas or topics is given below. Please review each area and indicate how frequently training was provided for your employees during the past two years. Circle your answer. Leave column 6 blank at this time.

FREQUENCY OF TRAINING
1 - No Training = NONE
2 - No Regular Schedule = NRS
3 - Annually = AN
4 - Monthly/Quarterly = M/Q
5 - Continuously = C

		FREQUENCY OF TRAINING				
AREA OF TRAINING	NONE 1	NRS 2	AN 3	M/Q 4	C 5	6
1-2. Quality (Quality Mgmt., SPC, etc)	1	2	3	4	5	___
3-4. Participatory Management (Self Managing Teams)	1	2	3	4	5	___
5-6. Problem Solving/Decision Making/Thinking Skills	1	2	3	4	5	___
7-8. International Marketing/Global Market Place	1	2	3	4	5	___
9-10. Automated Manufacturing (CAM, Robotics, etc)	1	2	3	4	5	___
11-12. Computer Assisted Design (CAD)	1	2	3	4	5	___
13-14. Electronics	1	2	3	4	5	___
15-16. Flexible Mfg. Cells/ Group Technology/JIT/etc	1	2	3	4	5	___
17-18. Other Specific Technical Training	1	2	3	4	5	___
19-20. Basic Literacy (Reading, Math, Communications)	1	2	3	4	5	___
21-22. Train The Trainer	1	2	3	4	5	___
23-24. Career Planning/Human Resource Development	1	2	3	4	5	___
25-26. Human Relations Skills	1	2	3	4	5	___
27-28. Computer Usage	1	2	3	4	5	___
29-30. Artificial Intelligence	1	2	3	4	5	___
31-32. Automated Office Systems	1	2	3	4	5	___
33-34. Other (List)________________	1	2	3	4	5	___
35-36. Other (List)________________	1	2	3	4	5	___

37. Please go back and place a check mark (✓) in column 6 after each area/topic in which you plan to offer training in the next twelve months. ↑

38-44. What type(s) of help could you use for planning, conducting and managing your training/educational program? Check all that apply.

(38). ______ Needs Assessment (Identify Training Needs)

(39). ______ Designing And Developing Training Materials

(40). ______ Planning Training Courses

(41). ______ Identifying Qualified Instructors For Our Training Courses

(42). ______ Assistance With Conducting and Managing Training Courses.

(43). ______ Evaluating The Effects And Outcomes Of Our Training Courses

(44). ______ Other ____

45. What Other Needs Or Problems Do You Have Related To Training?

46. Type of Business (Check One):

(1) ___ Agriculture, Mining, Energy, Construction
(2) ___ Broadcasting, Publishing, Advertising
(3) ___ Finance, Insurance, Banking, Real Estate
(4) ___ Health, Medical Services
(5) ___ Hotel, Restaurant
(6) ___ Manufacturing
(7) ___ Retail, Wholesale
(8) ___ Transportation, Utilities, Communications
(9) ___ Other (Please Specify): __________

47. If you are a Training Director/Human Resources Director or other individual designated as responsible for training, please check your appropriate title below (Only one check):

(1) ___ Training Director
(2) ___ Human Resources Director
(3) ___ Personnel Director
(4) ___ Other (Please specify): ____________________
(5) ___ We do not have anyone designated as being responsible for training

48. Organizational Structure:

(1) ___ Single location business
(2) ___ Multiple location business (Within WI only)
(3) ___ Multiple location business (Some sites outside of WI)

49. Number of Employees (WI only):

(1) ___ 1 - 19
(2) ___ 20 - 99
(3) ___ 100 - 499
(4) ___ 500+

If you would like a copy of the results of this survey study, please indicate this and print your name and address in the space below:

Name ______________________ Title ______________________

Address ______________________ City ____________ State ________ Zip ________

Please return the survey in the enclosed envelope. Thank you for your time and input.

Orville Nelson, Director
High Tech Training Project
CVTAE, UW-Stout
218 Applied Arts Building
Menomonie, WI 54751
(715) 232-1362

APPENDIX B

Questionnaire, Telephone Follow-Up of Non-Respondents

Two copies of a survey were mailed to your business/firm, one during June and the other during August. Since we did not receive your response, may I have a few minutes of your time?

This survey is part of research being conducted to identify competencies where emphasis must be placed in the secondary and postsecondary schools to prepare individuals with the competencies needed by business and industry.

I have five general questions I would like to ask concerning the training conducted by your business or firm.

1. Was training provided to employees during the past year?

   ___ yes ____no

2. In what areas or on what topics was the training provided?

   ____
   ____
   ____

3. What was the training frequency?

   __None __No. Reg. Sch. __Annual __Mon/Qtrly __Continuously

4. In what area or topics do you plan to offer training within/during the next twelve months?

   ____
   ____
   ____

I have four additional questions concerning your business or firm.

5. What type of business is it? ______________________________

6. What is the appropriate title for the individual designated as responsible for training? ______________________________
   ____

7. Organizational Structure:

   (a) ___Single location business

   (b) ___Multiple location business (Within WI only)

   (d) ___Multiple location business (Some sites outside of WI)

8. Number of Employees (WI only)

   (a) ___ 1 - 19

   (b) ___ 20 - 99

   (c) ___ 100 - 499

   (d) ___ 500 - or more

Firm____________________ Phone#____________________

APPENDIX C

Basic Descriptive Statistics

Basic Descriptive Statistics

Mean. The mean can be used to identify the typical response on a scale that has equal response units. For instance, the average number of employees would be an appropriate application of the mean. If a likert type rating scale format is used to evaluate certain or services programs provided by your school program, the average response would be a way of determining the level of satisfaction with each characteristic.

Median. Another measure of typical value is the median. The median is the point at which one-half of the responses are above and one-half of the responses are below. It can be used in situations where the response intervals are not of equal value. For example, the median level of education of employees would be an appropriate application of this statistic when the survey question asks for the highest degree or level completed.

Mode. The mode is the third statistic used to reflect typical value. It is the response choice selected most frequently. The mode is useful in situations where the responses to a question are categorical and are on a continuum or scale. For instance, the mode would be the appropriate statistical measure for reporting the city, county, region, or area in which most of your responding businesses or industries are located.

Range. In some instances it is desirable to report the variability in the responses as well. The range is probably the most commonly used measure of variability. The range of the number of employees for example, may be as interesting as the average annual sales. People hear and see the ranges in temperatures each day as they view the weather news on TV. They also have an opportunity to experience the variations in temperature during the day and thus have a sense of what this variability means. The range is the difference between the largest and the smallest values. To illustrate this, suppose that the number of employees reported had a high value of 5,400 and low value of six employees. With a range in the number of employees of 5,394, the indication is a wide range in the number of employees for the businesses and industries in the sample.

Stand Deviation. Another measure of variability, the standard deviation, is an indicator of the degree to which individual values vary from the mean of the total set of values. The standard deviation has a more complex formula than any of the statistics mentioned so far. Typically it would be calculated by computer. A standard deviation of zero indicates that there is no variability, in other words, that all of the values are the same. As values spread out from the mean, standard deviation will become larger.

APPENDIX D

Sample Presentation Visuals

B/I Statewide Survey

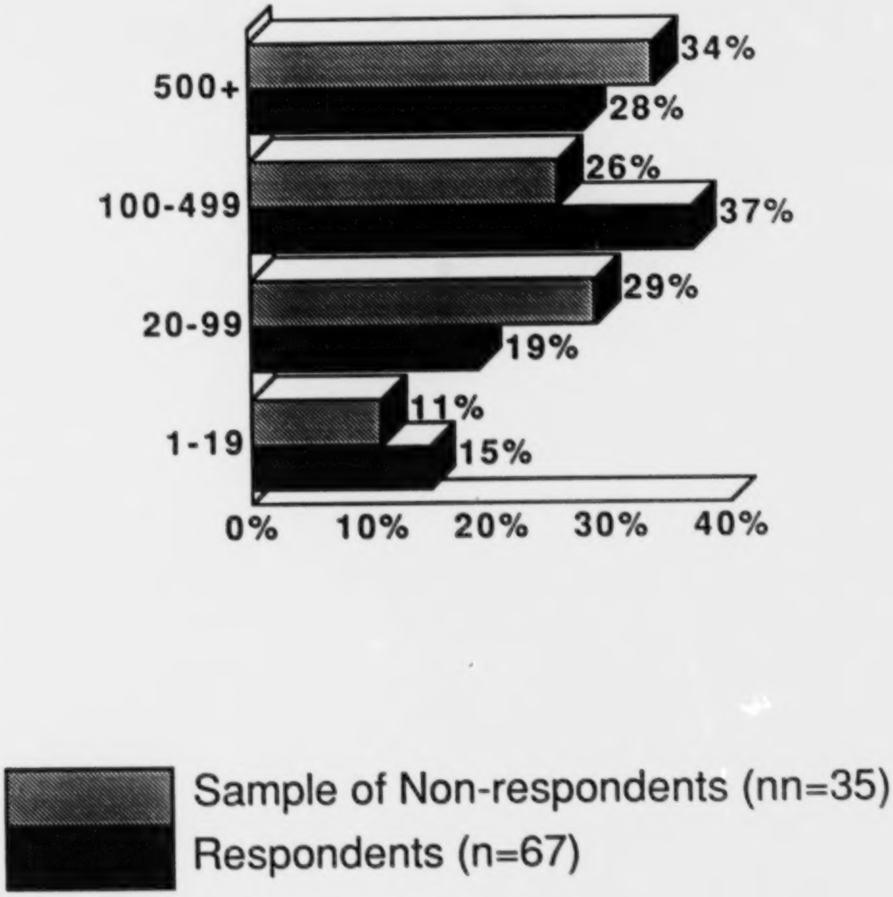
Corporate Distribution

Agriculture, Mining, Energy, Construction	9%
Broadcasting, Publishing, Advertising	0%
Finance, Insurance, Banking, Real Estate	1%
Health, Medical Services	4%
Hotel, Restaurant	0%
Manufacturing	76%
Retail, Wholesale	6%
Transportation, Utilities, Communication	0%
Other	4%

B/I Statewide Training Survey

Demographics: Number of Employees

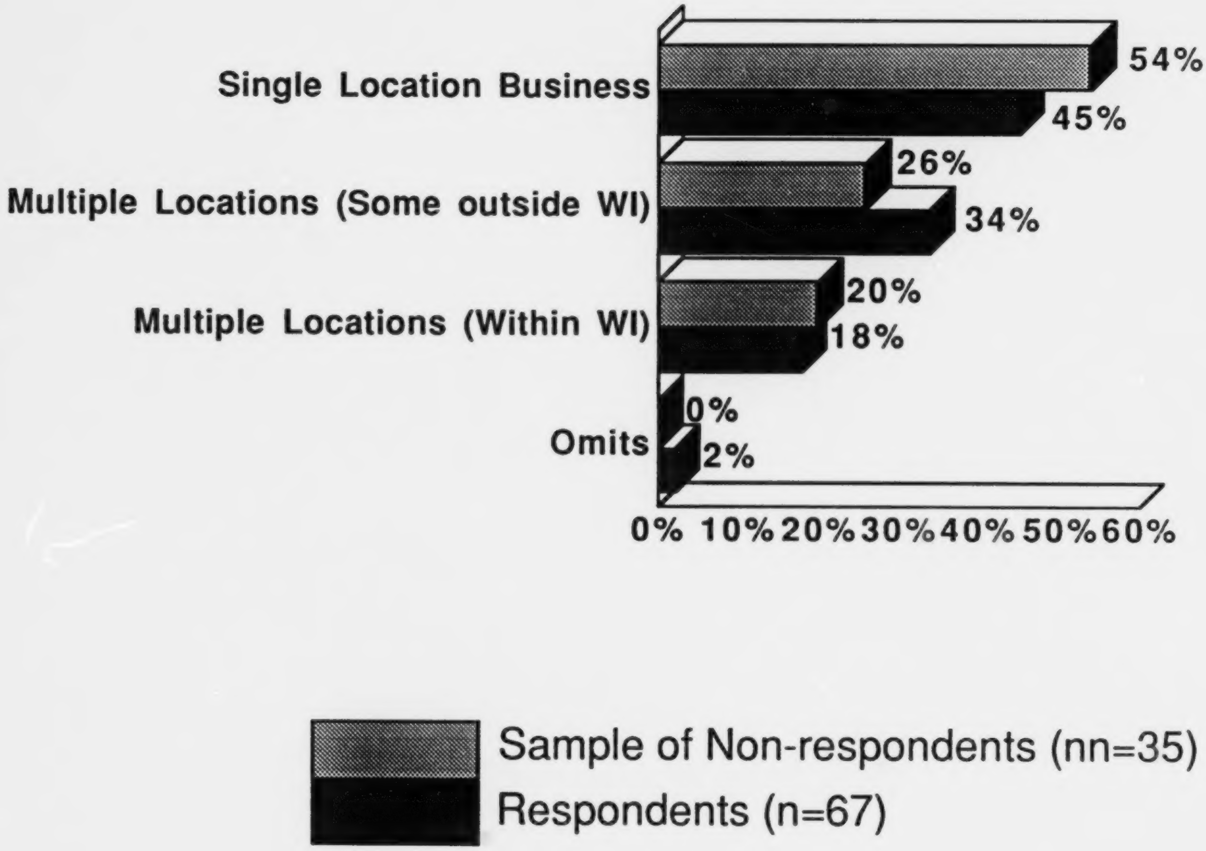
Number of Employees (WI only) Fall 1989



B/I Statewide Training Survey

Demographics: Organizational Structure

Fall 1989



B/I Statewide Training Survey

High-Technology Related Training Survey

n = 67 Return 24%

Fall 1989

Frequency of training they provided to employees during the last two years, and training projected for the next 12 months

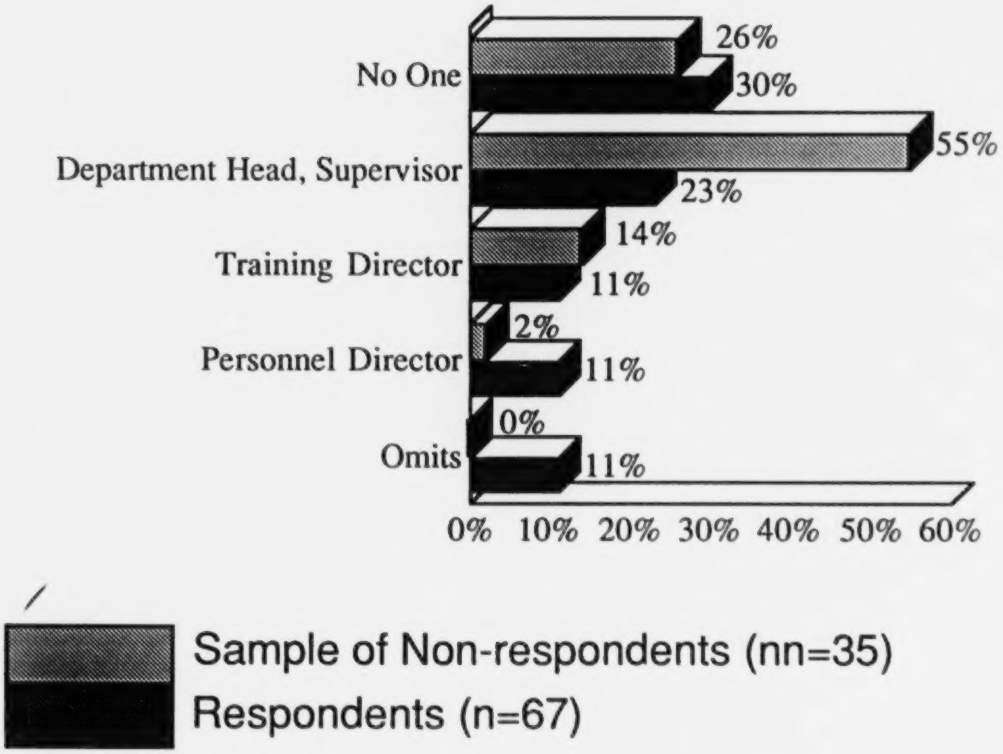
▨ Mode

Type of Training	During Past Two Years					
	No Training	No Regular Training	Annually	Monthly/ Quarterly	Contin- uously	During Next 12 Months
Quality (Quality Mgmt., SPC, etc.)	13%	33%	7%	6%	36%	45%
Particapatory Management (Self Managing Teams)	39%	25%	10%	4%	15%	30%
Problem Solving/Decision Making/Thinking Skills	31%	24%	9%	13%	18%	37%
International Marketing/Global Market Place	81%	4%			4%	3%
Automated Manufacturing (CAM, Robotics, etc.)	57%	27%		9%	4%	19%
Computer Aided Design (CAD)	58%	27%		4%	4%	18%
Electronics	57%	24%	4%		7%	16%
Flexible Mfg. Cells/Group Technology /JIT/etc.	60%	19%	3%	1%	7%	19%
Other Specfic Technical Training	28%	36%	3%	4%	21%	28%
Basic Literacy (Reading, Math, Comminications)	70%	16%		4%	3%	12%
Train The Trainer	58%	19%	6%	6%	4%	18%
Career Planning/Human Resource Development	51%	31%	1%	6%	4%	15%
Human Relations Skills	27%	46%	9%	4%	10%	36%
Computer Usage	16%	43%	3%	4%	27%	37%
Artifical Intelligence	81%	7%	1%			
Automated Office Systems	54%	25%		3%	9%	10%

B/I Statewide Training Survey

Designated Responsibility for Training

Fall 1989

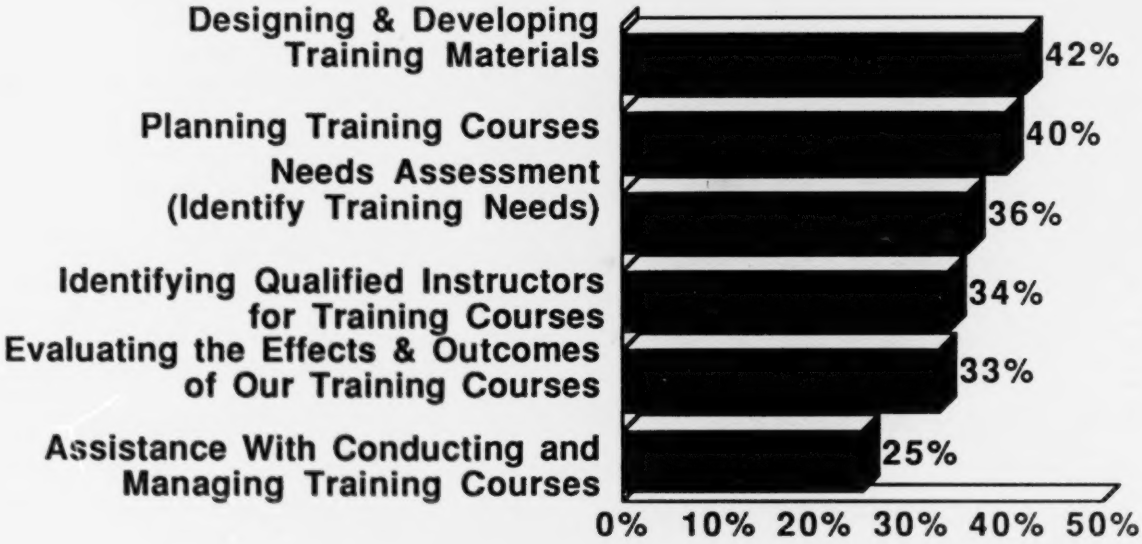


B/I Statewide Training Survey

Interest in External Training Assistance

n = 67 Return 24%   Fall 1989

Types of help respondents would use for planning, conducting, and managing Training/Education Program.



HIGH-TECHNOLOGY TRAINING
MODEL MODULE

Planning and Conducting an Interview Survey of Representatives of Businesses and Industries

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
J. Timothy Mero
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 126
Purpose 126
Objectives. 126
Value of Interview Surveys of Representatives of
Businesses and Industries. 127
Planning and Conducting an Interview Survey of
Representative of Local Businesses and Industries. . . .130
Data Analysis 136
Write Report. 138
Disseminate Results .139
Implement Changes 141
References 142

Appendices

A. High-Technology Training Model Project's B/I
Interview Questionnaire. 143
B. Reported Findings and Conclusions
of the High-Technology 146
C. Briefing Charts 155

PLANNING AND CONDUCTING AN INTERVIEW SURVEY OF REPRESENTATIVES OF BUSINESSES AND INDUSTRIES

Introduction

This module describes the procedures and actions required to plan and conduct an interview survey of representatives of businesses and industries. In some instances, the reader is referred to other modules that should be used in planning and conducting an interview. The body of this module describes the procedures and considerations needed to plan and complete a interview survey. In some instances, examples have been included in appendices. Where this is done, the reader will be referred to the appropriate appendix.

Purpose

The purpose of this module is to provide the information, procedures and considerations required to design and conduct an effective interview survey of representatives of businesses and industries.

Objectives

The objectives of this module are:

1. Identify the situations in which an interview survey of representatives of businesses and industries is an appropriate technique to acquire data.
2. Provide procedures and considerations that will allow the reader to plan and conduct an effective interview survey of representatives of businesses and industries.
3. Provide information and instructions on how to develop a

valid interview survey instrument.

4. Describe the advantages and disadvantages associated with interview survey procedures.

5. Suggest how to use the survey results.

Value of Interview Surveys of Representatives of Business and Industry

From an educational perspective, the purpose of a interview survey of representatives of business and industry is to obtain pertinent input from employers and employees for the improvement of educational programs and services.

When administrators and program directors/managers need information for program assessment, evaluation and decision making, they usually go to the source. One procedure frequently used is to survey representatives of businesses and industries to obtain information because they are the best available source for the required information. Surveys frequently serve as the primary means of gathering the required information. While surveys can provide timely information in response to specific research questions, they can also be costly and frequently provide less control. In each of the survey techniques, the administrator or manager conducting the survey is dependent upon the respondent's ability and willingness to provide accurate information. Regardless of the type of survey used, the basic purpose is to develop the necessary information upon which to base decisions.

The interview survey is the survey technique of choice if the gathering of information will be enhanced by its unique characteristics. Fay and Wallace (1987) point out that managers make more use of personal interviews as a survey techniques than is commonly thought. According to Fay and Wallace (1987), the interview survey technique is well suited to handle: (a) lengthy and/or complex subjects, and (b) were the data received might suggest the need to pursue a more detailed, indepth line of questioning. The interaction which takes place during the conduct of the interview along with the interviewer's ability to respond to various stimuli frequently results in a richer set of data than can be obtained using other survey techniques.

The interview surveys of representatives of local businesses and industries conducted by the educators participating in the High-Technology Training Model Project was considered to be a key element in the overall success of that project. Building on the unique advantages of the interview survey technique, the interview surveys afforded the opportunity and impetus for the participating educators to: (a) become more familiar with the extent to which local businesses and industries are adopting and applying new, high-technologies, (b) assess the applicability of their respective curriculums, and (c) identify changing skill and competency requirements relative to new, high-technologies.

The interview survey of local businesses and industries by the participating educators had specific value. First, it facilitated the movement of the participants out of their familiar, and very comfortable classroom, and out into the unfamiliar, ever-changing world of work. Second, the required interviews encourage articulation between educators and representatives from local businesses and industries. It is one thing to educate students and provide them a laundry list of competencies from which they can draw at some future date. It is quite a different thing for educators to have first hand knowledge and be able to explain how the particular competencies are being applied. Third, the development of an awareness among the participants of the new, or high-technology in use within their local area. Fourth, the identification of the new technology applications anticipated over the next three to five years. Fifth, the identification of the new skills or competencies employees will need, now and in the near future in response to the adoption and application of new, high-technologies. Sixth, the identification of additional entry-level skills graduates from the interviewer's school will need. The intent was to have the participating educators identify additional competency needs for the purpose of curriculum development. For the purposes of the High-Technology Training Model Project, no attempt was made to differentiate between the skills identified by secondary and postsecondary educators as interviewers. The intent was to identify the skills and competencies without attempting to discern at which educational level they should be taught. The final value was determining the level of involvement of local businesses and industries, and schools.

If there is any intent to infer anything about the local business and industries based on the interview survey sample population and the collected set of data, one must ensure that the requisite sampling techniques are employed. The module entitled: Selecting Appropriate Sampling Techniques and Determining Valid Sample Sizes, provides a general discussion of sampling techniques considered appropriate for the analysis of the accumulated data for the purpose of up-dating curriculum.

Planning and Conducting an Interview Survey of Representative of Local Businesses and Industries

There are three basic techniques for conducting surveys: (1) mail, (2) telephone, and (3) interview. Each of these techniques has its inherent strengths and weaknesses as an information-gathering process. Criteria for the selection of one of these information-gathering techniques over another are the type and amount of data desired, the availability of a target population, and the cost of the information-gathering process.

This module will be limited to interview surveys, some time referred to as one-on-one or personal interviews. For the purpose of this High-Technology Training Model Handbook, mail and telephone survey are addressed in the module titled: Planning and Conducting a Statewide or Regional Survey of Business and Industries.

The administrator/manager responsible for the coordination or conduct of the survey must establish the goal(s) for the interview survey. The survey's purpose and objectives will be based on the established goals and form the corner stone for the surveys design, development, conduct, and the analysis of the accumulated data.

In the case of interview surveys, there are two distinct goals the survey can serve. First, and most obvious, as noted by Fay and Wallace (1987), is the development of the needed data which may serve as the basis for decision making. Second, and less obvious, is the experience and exposure provided to the interviewer(s) who has (have) interaction with the respondents and other persons or stimuli during the conduct of the interview. This is especially true when the interviews are conducted on site, at the business or industry.

In the case of the High-Technology Training Model Project, the 103 interviews of representatives of local business and industry were conducted by the 45 participating educators. The interview survey was a key element in achieving the project's goal of bringing business and industry, and education together to identify new competencies and skills needed by entry-level employees. The goal was not to generate or conduct occupation task analysis. The following five, broad objectives were established for that interview survey of representatives of local businesses and industries.

1. Get the participating educators out of the classroom, their academic environment and conducting on-site visits of local business and industries.
2. Encourage articulation between educators and representative of local businesses and industries.

3. Develop an awareness, on the part of the participating educators, of the new or high-technology currently in use by local businesses and industries.

4. Identification of the new technology application that local businesses and industries anticipate adopting within the next three to five years.

5. Identification of the changing competency and skill requirements associated with the high technologies for current employees and new entry-level employees.

Advantages

Apart from the high cost of transportation, which may be geographically restricting and preclude using a widely dispersed sample, interview surveys have many advantages. According to Jaeger (1988), some survey researchers consider the selection of any of the alternative survey methods as being totally unacceptable. The following advantages of the interview survey are frequently noted.

1. The interviewer can provide clarification or any survey question the respondent does not understand or misinterprets.

2. The interviewer has the opportunity to ask additional questions to clarify a respondent's answer (Jaeger 1988).

3. The interviewer can respond to answers --data-- received by probing with a further line of questioning (Jaeger, 1988; Fay and Wallace, 1987).

4. The interviewer has visual contact with the respondent.

5. The interviewer can observe the respondent's environment

which can be an important factor (Jaeger, 1988).

6. The interviewer, if properly trained, can react to the respondent's body language which may indicate the respondent's willingness to respond, understanding of the question, and if the respondent actually has more to offer (Jaeger, 1988).

7. It is possible to have much less structure in an interview survey (Fay and Wallace, 1987).

8. The interviewer can incorporate visual aids, samples and other materials to elicit responses from the respondent (Jaeger, 1988).

9. The total interaction which take place between the interviewer, respondent, and other persons or stimuli can result in a much richer set of data.

10. The rate of respondent cooperation is generally much higher with interview surveys than other survey techniques (Jaeger 1988).

11. The interview provides the interviewer with the opportunity to assess the respondents environment as a response factor.

Interview Guide

Survey developers agree that in order to obtain standardized, comparable data from each respondent and each interviewer; each interviewer must have a written interview guide containing the questions. The guide must indicate "the questions to be asked and in what order, and what additional prompting or probing is permitted" (Gay, 1981, p.166).

1. Each question must be clear and unambiguous (Jaeger, 1987; Gay, 1981).

2. Gay (1981) points out that although interview surveys are generally less structured and therefore involve less structured questions. The use of a semistructured question format is usually appropriate. In a semistructured question format, the interviewer asks a structured question, normally limiting the interviewee's response; then follows with a clarifying unstructured, or open-ended question. Gay (1981) suggests that the interviewee's response to unstructured questions provide explanation and understanding for their response to the corresponding restricted question.

3. Each question must relate to a specific objective of the study (Jaeger 1988; Gay, 1981).

4. Interviews should be just as brief as possible (Gay, 1981).

5. The use of leading questions should be avoided (Gay, 1981).

6. Keep the vocabulary level in the questionnaire appropriate for your sample population and as low as possible without being insulting (Jaeger, 1988).

7. Avoid the use of specialized jargon and acronyms. If there is no alternative, ensure that such terms are clarified (Jaeger, 1988).

Appendix A contains a copy of the questionnaire developed for interview of representatives of local businesses and industries by the educators participating in the High-Technology Training Model Project. One must keep in mind that the purpose of that interview survey was as much for the education and development of the educators conducting the interview, as it was for the accumulation of the needed data.

Conduct of the Interview

Gay (1981) clearly points out the importance of properly training each interviewer to conduct the interview and the impact such training can have on producing standardized results. Effective communication, therefore, is a critical element.

The interview must start on the right foot. Before the first formal question is asked, sufficient time must be spent establishing the necessary rapport, explaining the purpose of the interview and study, and assuring the strict confidentiality of all responses.

As the interview continues the interviewer must remain alert and let the respondent's reactions guide the interview.

Recording the Data

Interviews lend themselves to mechanical recording with the use of any number of audio recording devices or manual recording by the interviewers. If the interviewer is to manually record responses, the interview guide must provide adequate space after each question. The responses may be recorded as the interview progresses or shortly after the interview is completed. Although there are advantages to each recording method, the use of a mechanical recorder is recommended whenever possible. Mechanical recordings are considered to be more efficient and more objective.

Pretesting

While Fay and Wallace (1987) indicate that "personal interviews may require less pretesting" (p.131), Gay (1981) recommends that the interview guide, interview procedures, and the analysis procedures all be tried out before the actual study begins; and that the pretest sample be from or representative of the survey population.

In the case of the High-Technology Training Model project, four staff members participated in not less than seven interviews to pretest all elements of the interview survey. The staff trained the 45 participating educators who in turn conducted the 103 interviews which comprised the survey. It should also be noted that over one-third of the interviews were conducted as team interviews by two to three interviewers. In those situations one interviewer functioned as the primary interviewer actually conducting the interview while the other interview team members functioned as observers and recorders.

Data Analysis

Editing

Before analysis of the data received in the survey can begin, it must be edited and entered. As Fay and Wallace (1987) noted, no matter how well the interview guide and the questions are laid out, or how well the interviewer(s) is trained, some unexplainable results will be received. Jaeger (1988) as well as Fay and Wallace (1987) point out the necessity for establishing detailed decision rules (or protocol) for the interpretation and coding of responses. This is particularly important in the case of the unstructured, open-ended questions. The key problem as Fay and Wallace point out is "false or misleading information" (1987, p.131). Jaeger (1988) stresses the importance of being able to assign each response to one (and only one) category. The decision rules must insure that all categories are exhaustive and mutually exclusive. This may necessitate including such categories as miscellaneous and does not apply.

Entered Data

The data analysis to be used must be based on the study's objectives. In some instances, the study's objectives will require comparisons. For example, an objective concerned with identifying responses by industry/business type will require a breakout by industry. Statistically, this is referred to as cross-tabulating. This will require pre-planned coding for data entry and processing. Many statistical programs are available for data analysis with this capacity. The following two points should be considered.

1. Individuals responsible for data analysis must ensure that the available software to be used will have the required capacity.
2. The data analyst should also be asked to jointly review the printouts.

Analysis of Data

A basic statistics book should be consulted for more indepth information on these statistics and to explore a wide variety of additional statistics available. One should consider consult with a person who specializes in statistical analysis. This individual can quickly suggest the appropriate types of statistics and statistical analyses that would be appropriate for your objectives. The statistical analyses used should be understood by your audience and appropriate for the data to be analyzed. It may be necessary for you to have more sophisticated analyses run to address specific objectives of the survey.

Write Report

Two major factors need to be considered when developing the report or reports from the business and industry survey. First, what are the characteristics and information needs of the audience(s) that will receive the report? Second, what are the objectives or purposes for undertaking the survey of representatives of local business and industry survey?

In most situations, there will be several audiences that will have an interest in the survey results. Administrators, teachers, advisory committee members, local students, and state and regional educational agencies are typical audiences for a business and industry survey. There is probably a core of information that will be of interest to most,if not all, of the audiences. Also, there will be some pieces of information that will have special value to specific groups. Before writing any reports, it would be a good idea to look at each of the potential audiences and identify their primary interests and the types of information they can process most readily. After this is done, a specific audience can be selected and the report writing can be initiated.

Many audiences are concerned about the outcomes of the study and are not as interested in the details on how the study was conducted. For these audiences, report the major outcomes first. Place those items of greatest interest first in the report. Write in a conversational style. A paragraph or two at the end of the report can be devoted to some of the major details of how the survey was conducted and who was involved in the survey.

You will probably need to do a more formal report of the results also. The formal report should contain the following sections: (a) Cover page, (b) Abstract, (c) Table of Contents, (d) Part I - Purpose and Objectives, (e) Part II - Review of Previous Research, (f) Part III - Survey Methodology, (g) part IV - Findings (Results), (h) Part V - Conclusions and Recommendations, (i) References and (j) Appendices.

Disseminate Results

Dissemination of the results should be made to groups and individuals who could benefit by learning more about the results of the survey. Where possible, presentations should be made to interested groups. Visual aids that present key results are also helpful. A brief handout that contains the major results presented provides and effective supplement to the presentation. Be sure to share the results with teachers, counselors and administrators. Also, some of the results may be relevant to current students. Use your creativity to identify dissemination strategies that will effectively reach people who need to know about your programs. Do not be afraid to try something different.

Appendix B is presented as an example of reporting of significant findings and conclusions from an interview survey of representatives of local businesses and industries. The interview survey was conducted as part of the High-Technology Training Model Project, and the data was collected using the interview guide contained in Appendix A.

Appendix C contains copies of selected briefing charts developed based on the analysis of data resulting from the High-Technology Training Model Projects interview survey of representatives of local businesses and industries. The briefing charts are presented as examples and include: (1) the corporate distribution of the businesses and industries surveyed, (2) the corporate size, (3) new technologies currently used and/or planned during the next 3-5 years (only technologies with a combined use/need of 15% or more are shown), (4) new skills and competencies current and/or entry level employees need, (5) anticipated sources for new technology related skills training, (6) current or willingness of local businesses and industries to work with local schools, and (7) the willingness of local businesses and industries to provide intern experiences for teachers.

Implement Changes

One of the most effective ways of implementing change is to involve the people who will need to change and make changes in the process of identifying what modifications need to be made in existing courses, programs and services. It was for that specific reason that all 45 of the educators participating in the High-Technology Training Model Project were required to participate as an interviewer in the interview survey of representatives of local businesses and industries. There was no outside source who came into their classrooms with a new bag of tricks and all the answers. The resulting data is theirs. By involving the educators in the development of the data, they willingly accepted the results, and were able to implement curriculum changes in their courses based on that data.

After your staff has had an opportunity to review the results of the business and industry, interview survey of representatives, they should be involved in discussion groups to identify needs and priorities. Once this has been completed, they can help establish objectives and select strategies to accomplish these objective.

Often the plan for change gets hung up with the barriers. It is important to identify the objectives and where your program need to be. After this has been done, brainstorm ways to achieve those goals. Do not let the barriers or problems interfere with the brainstorming process. They can always be factored into your planning later.

References

Gay, L. R. (1981). Educational research: Competencies for analysis and application. Columbus: Merrill Publishing co.

Fay, C. H. and Wallace, M. J., Jr. (1987) Research-based decisions. New York: Random House.

Jaeger, R. M. (1988). Survey research methods in education. In Jaeger, R. M. (Ed.), Contemporary methods for research in education. (pp. 303-330) Washington, DC: American Educational Research Association.

APPENDIX A

High-Technology Training Model Projects' B/I Interview Questionnaire

HIGH TECHNOLOGY TRAINING MODEL PROJECT

CVTAE
3/2/89

B/I INTERVIEW SURVEY

Directions: Interview three to five people in local businesses or industries. If possible, select B/I's that employ your graduates. Record the major comments on this form. You may want to ask other questions as well.

Business/Industry ______________________ Date ______________

Address ______________________ City ______________ Zip __________

Person(s) Interviewed: ______________________________

Interviewer: ______________________________

1. What are your major products/services? (If you already know, then go to question 2).

2. How many people do you employ in this city or county? ____________

3. What new technology are you using in your company? (New technology - equipment, processes, management techniques, etc.)

4. What new technology are you planning to use in the next 3 - 5 years?

5. What new skills or competencies do your employees need?

6. How are these skills/competencies developed? (ie. the skills listed in 4).

7. What additional skills do graduates from our school need as they start work with your company? (If possible, refer to a specific graduate or graduates from your school who have worked at this company).

8. Ask how they work with local schools. Some examples are given below:

   a. Serve on advisory committees

   b. Teach a course(s)

   c. Provide visiting speakers

   d. Provide cooperative education work sites

   e. Provide work experiences for students

   f. Provide summer work experience for teachers

   g. Provide shadowing experiences for students

   h. Host student tours/field trips

   i. Other ______________________________

9. If they do not do any of the activities listed in eight, ask if they would be interested in participating in one or more of these.

10. Would your company be willing to serve as an intern site for a teacher this summer? (ie. Provide paid work experiences or opportunities to shadow/observe in the company).

APPENDIX B

Reported Findings and Conclusions of the High-Technology Training Model Projects' Interview Survey of Representatives of Local Business and Industries

Reported Significant Findings and Conclusions for the Interview Survey of Representative of Local Business and Industries

Significant Findings

1. In rural West Central Wisconsin, 60.2% of the businesses and industries surveyed manufactured a product using raw stock material and/or assembled components to produce a product.
2. Within rural West Central Wisconsin, 77% of the businesses and industries surveyed were small business. A small business is statistically defined based on the 10th Annual Grant Thornton Manufacturing Climate Study, which classifies a small business as one with less than 500 employees.
3. Based on the cumulative response to questions 3 and 4, respondents reported the cumulative results for new technologies currently in use or planned to use in the next 3-5 years.

New Technology	Current Use(%)	Planned Use(%)	Combined Use(%)
Production			
CAD/CAE	40	31	71
CAM	22	23	55
NC	9	11	20
CNC	36	20	56
Robotics/machine centers	28	21	49
Jigs & fixtures	16	21	37
Flexible manufacturing (cell/system)	5	21	26
Laser cutting & control	18	18	36
Alternative materials	15	12	27

New Technology	Current Use(%)	Planned Use(%)	Combined Use(%)
Quality			
Lasers (measurement)	7	8	15
Production/product testing	16	18	34
MRP II	6	8	15
Electronics	10	5	15
Material Control			
JIT	16	8	24
Optical scanning/coding	27	19	46
Distribution	11	11	22
Computerized inventory	13	10	23
Business			
Word processing	15	6	21
Information storage/retrieval	15	8	23
Communications			
Electronic mail/FAX	15	15	30
Telecommunication	16	10	26
Data link (networking)	16	13	29
Computer Microprocessor			
Applications	35	21	56
Scheduling (personnel/product)	12	3	15
Personal computers	19	3	22
Billing	14	2	16
Accounting	7	8	15
On-line applications	13	8	21

New Technology	Current Use(%)	Planned Use(%)	Combined Use(%)
Personal computers	19	3	22
Billing	14	2	16
Accounting	7	8	15
On-line applications	13	8	21
Advance Technology	11	8	19

4. Based on the combined responses to questions 5 and 7, the respondents reported the cumulative need for new skills or competencies current employees and new entry level employees need.

	Employees		
Additional Skills/ Competencies	Current %	New Entry Level %	Combined New Skill Requirements %
Computer Applications			
General	7	27	34
Published/special designed software	38	9	47
Manage array of activities	20	0	20
Control machine software	19	6	25
Programming	11	0	11
Data management	16	0	16
Computer Operator Skills	40	0	40
Keyboarding	16		16

Additional Skills/ Competencies	Current %	New Entry Level %	Combined New Skill Requirements %
Math			
Applied	21	29	50
Basic	16	27	43
Advanced	7	7	14
Keyboarding	16		16
Thinking Skills/Problem Solving			
Critical thinking/ reasoning	16	25	41
Troubleshooting/problem solving	27	43	70
Communications			
General	8	13	21
Oral	19	31	50
Visual/reading	26	27	53
Writing	9	30	39
Technical			
Literacy	27	23	50
Proficiency	48	26	74
Applications	0	16	16
New manufacturing processes	0	15	15
Mechanical background	0	21	21
Techniques	0	14	14
Certification	1	0	1

Additional Skills/ Competencies	Current %	New Entry Level %	Combined New Skill Requirements %
Work Ethics			
General	0	10	10
Attendance/punctuality	0	9	9
Cooperation	2	5	7
Self management	0	14	14
Time management	0	16	16
Developmental			
Attitudes	15	26	41
Common sense	2	6	8
Creativity	0	13	13
Comprehension	0	3	3
Dexterity	0	4	4
Follow instructions	0	10	10
Inquisitiveness	0	6	6
Interviewing	0	2	2
Know how to learn	10	14	24
Physical strength	0	2	2
Resume writing	0	1	1
Spatial	0	14	14
Self confidence	0	14	14
Willingness to learn	0	9	9
Adaptation to change	15	0	15
Self motivation	8	0	8
Electronics	42	12	54

4. When asked how the new skills and competencies current employees need are developed, respondents indicated the following major sources:

	Source	%
a.	Technical Colleges	64
b.	In-plant (informal)	63
c.	In-plant (formal)	62
d.	Vender/Manufacturer	27
e.	University (Scheduled Courses)	24
f.	Secondary School	21
g.	Prior Experience	18
h.	Tuition Reimbursement (source not specified)	16
i.	Seminars	12
j.	Workshops, Shows, Conferences	9
k.	Manuals	9
l.	Corporate Out Of Plant	6
m.	Consultants	6
n.	Apprenticeships	6
o.	Professional Organizations	2
p.	Customized Training	2

5. Respondents indicated positive willingness to work with local schools by (1) providing tours - 78%, (2) serving on advisory committees - 69%, (3) providing speakers - 65%, (4) providing student work experiences - 62%, (5) providing a Co-op educational work site - 41%, (6)

providing a shadow experience for students - 36%, (7) providing a summer work experience for teachers - 35%, (8) teaching a course - 34%.

Conclusions

1. The responding businesses and industries did not downgrade or de-emphasize the current curriculum efforts and requirements. The findings simply identify additional skill and competencies which should be emphasized to provide graduates with the high-technology related skills and competencies necessary for successful employment in a changing, technology driven work environment.

2. The finding emphasized those skill and competencies associated with computer applications and computer aided processes to include: design/engineering, manufacturing, material control, quality assurance, and business applications.

3. The additional skills and competencies needed for current employees centered around specific technological applications and current production proficiency. The additional skills and competencies identified for new entry-level employees reflect general skills, production technology, attitudes and ethics.

4. Electronics (as a skill or competency), like computers, appears to be a generalizable area of emphasis which crosses most disciplines associated with new, high-technologies.

5. The role of the technical college as a training source for rural-based industries can not be over emphasized. The local technical college can directly or contractually provide: (a)

formal and informal in-plant training, and vender/manufacturer certified training.

6. The responding businesses and industries, when asked, appear to be very willing to work with local schools.

7. The need for meaningful articulation programs between businesses and industries, secondary, and postsecondary schools should receive emphasis with each participant serving as an equal.

APPENDIX C

Briefing Charts

B/I Interview Survey

Corporate Distribution

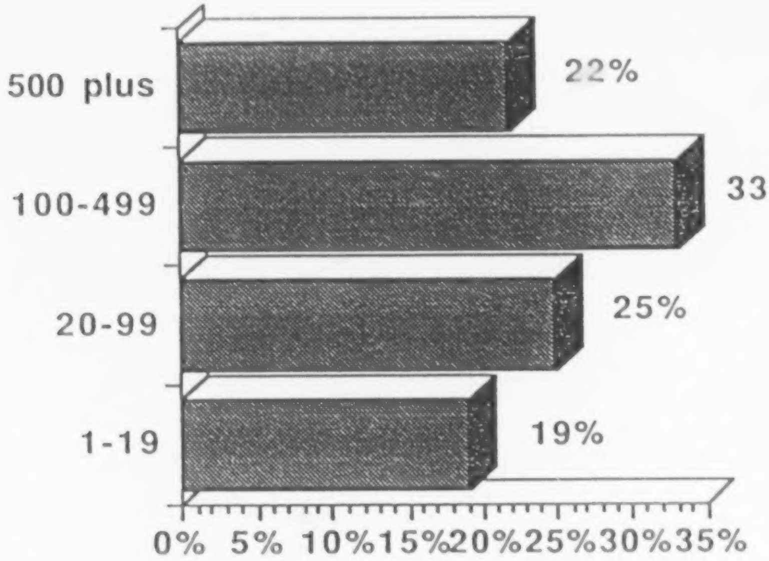
(N=103 Survey Period May 1989-January 1990)

Manufacturing (Heavy)	60.2%
Administrative Services	8.7%
Consulting (Engineering)	3.9%
Communication	6.8%
Marketing	6.8%
Others (Less than 2% each)	12.6%

B/I Interview Survey

Corporate Size At Interview Location

(N=103   Survey Period May 1989-January 1990)

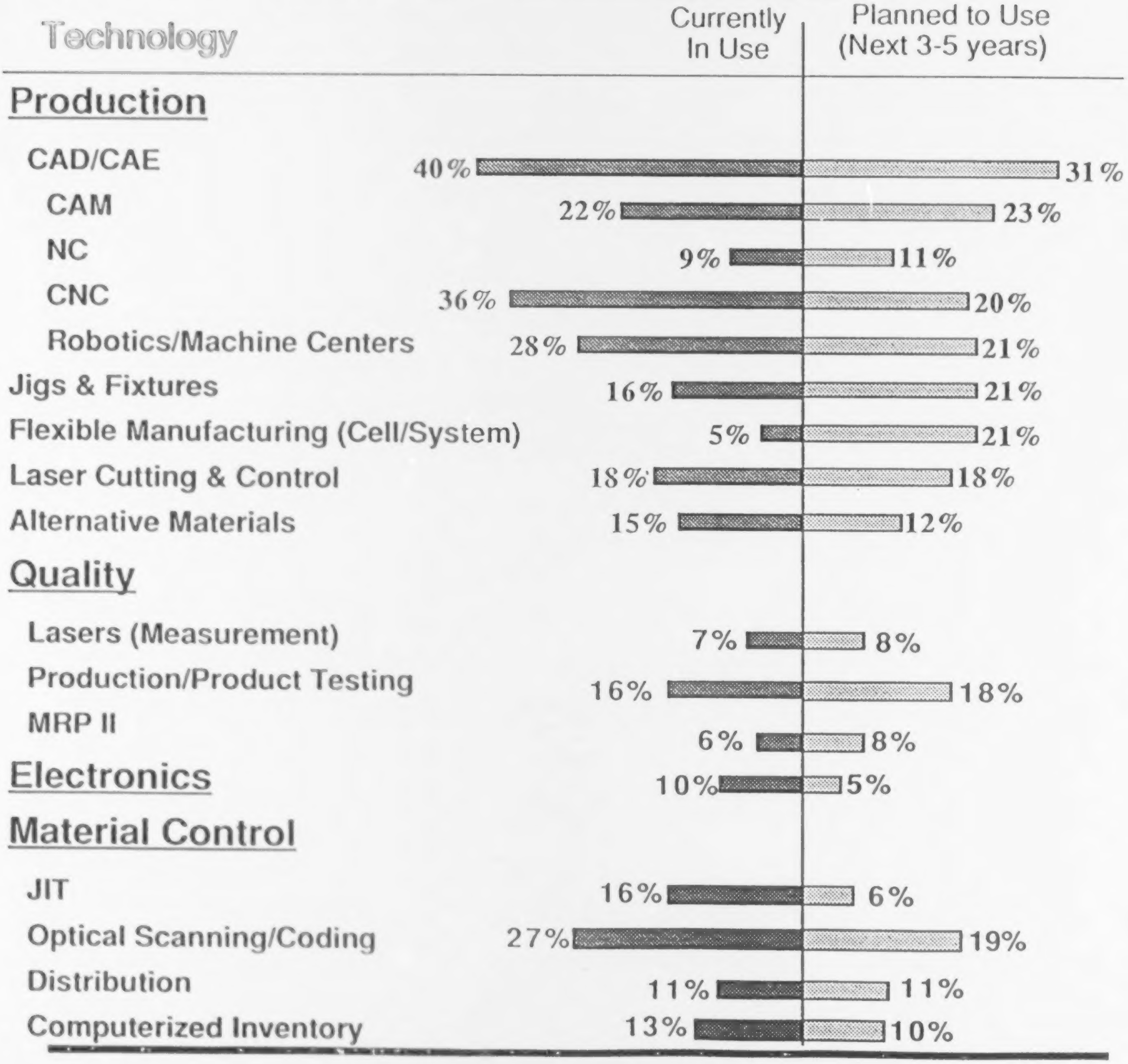


B/I Interview Survey

B/I Interview Survey

New Technologies: Response to open-ended questions

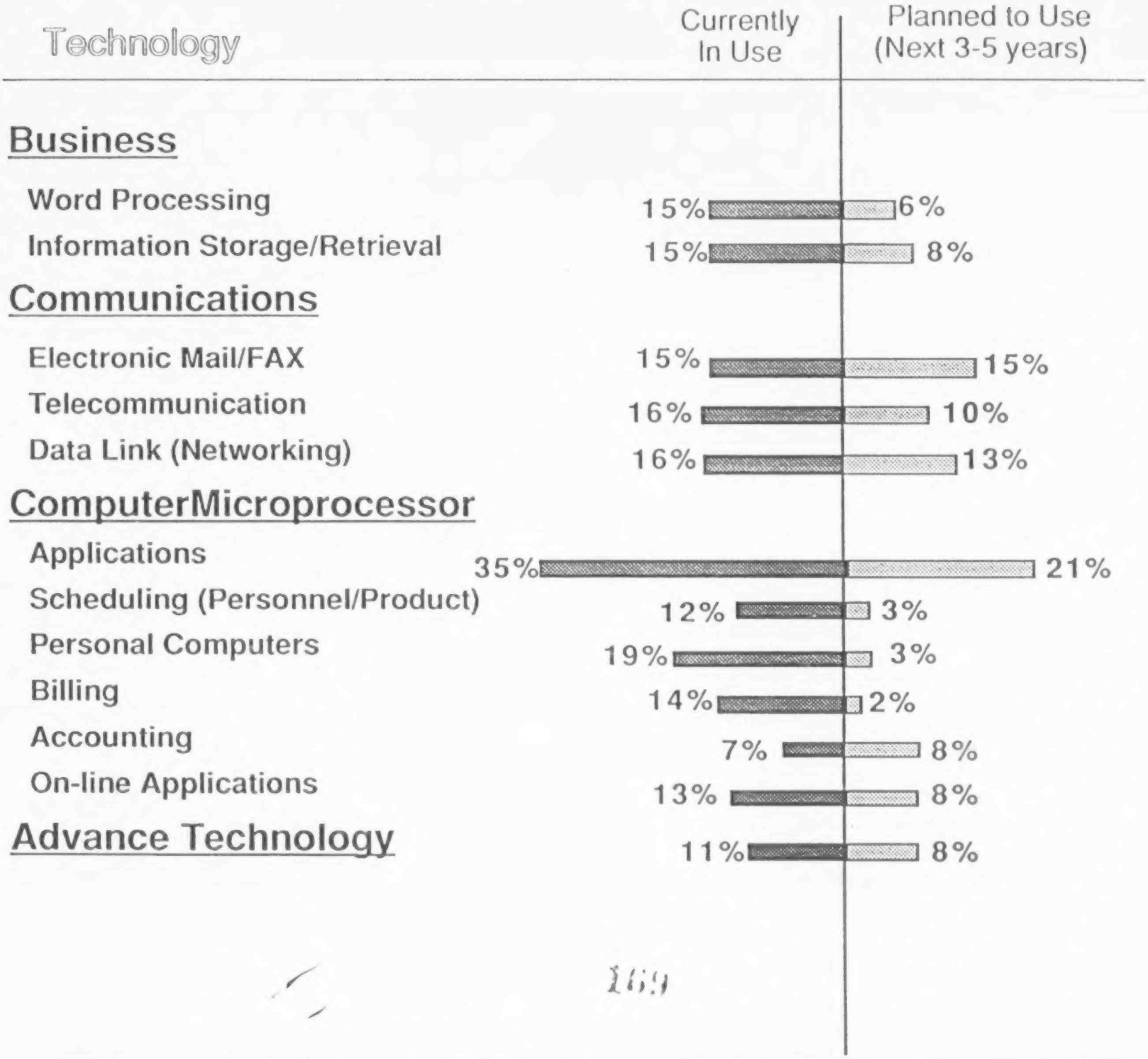
Combined Use/Need of 15% or More
Survey Period May 1989 - Jan 1990



B/I Interview Survey

New Technologies: Response to open-ended questions

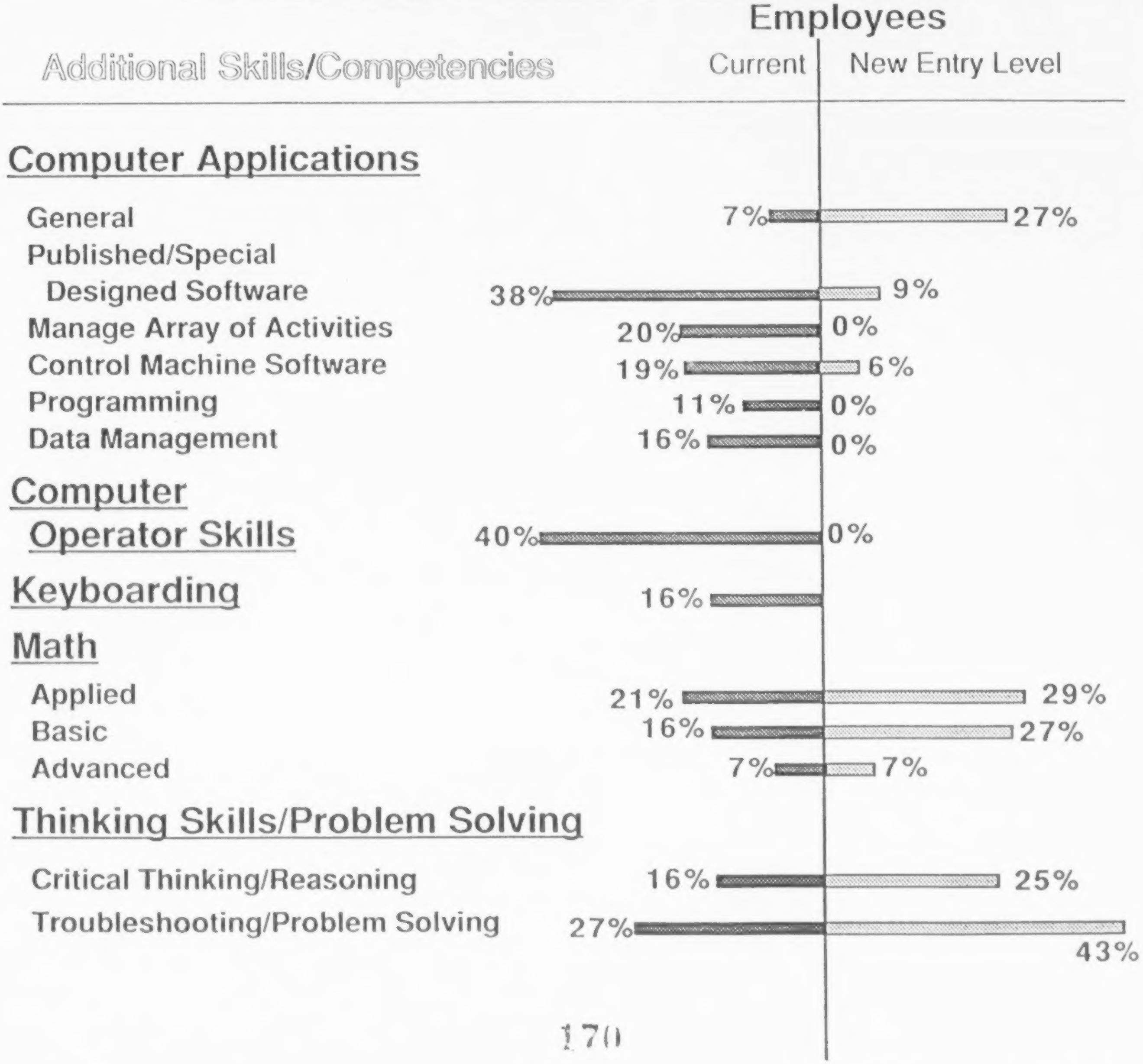
Combined Use/Need of 15% or More
Survey Period May 1989 - Jan 1990



B/I Interview Survey

New Skills & Competencies Employees Need: Response to open-ended questions

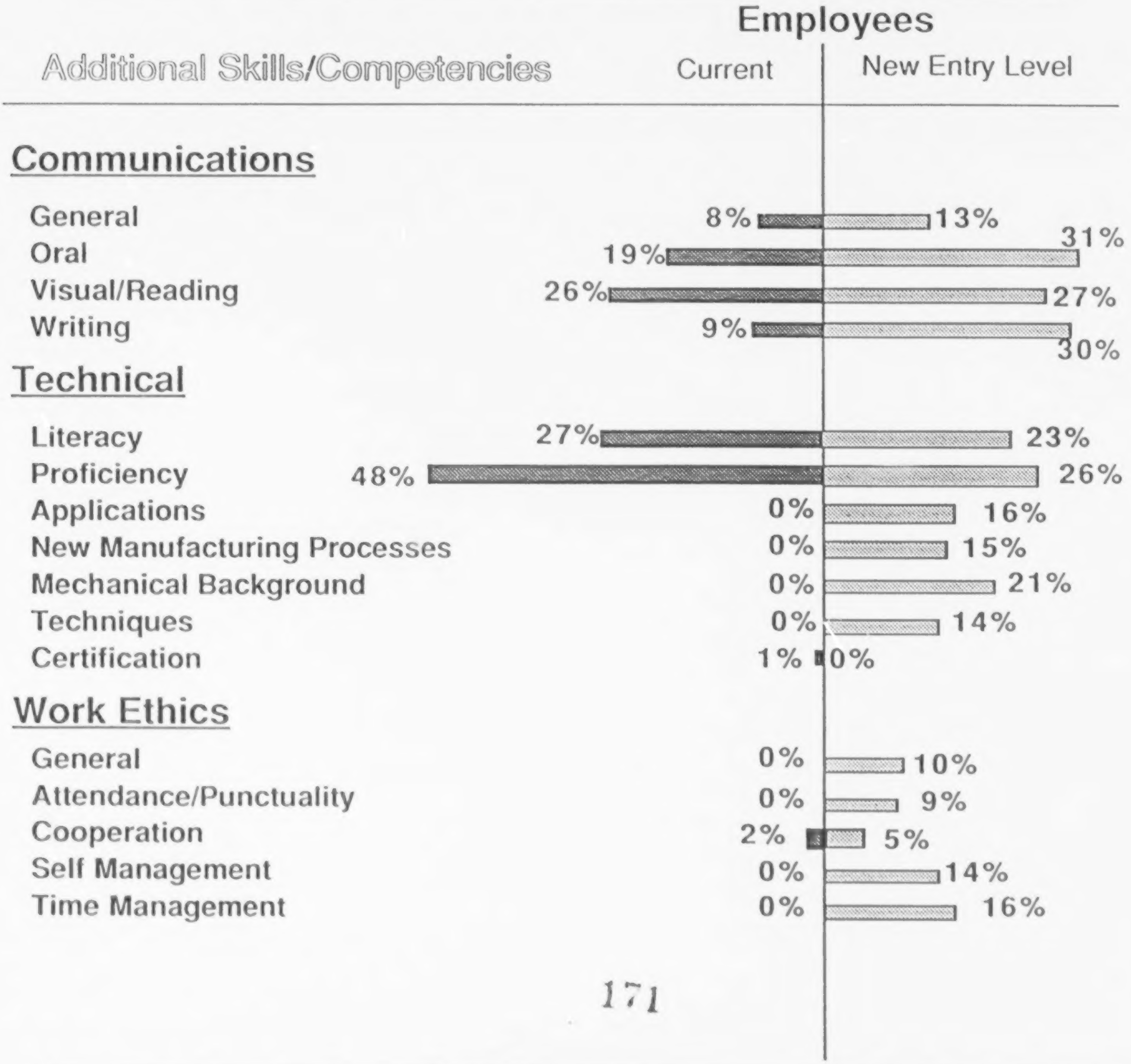
N=103 Survey Period May 1989-January 1990



B/I Interview Survey

New Skills & Competencies Employees Need: Response to open-ended questions

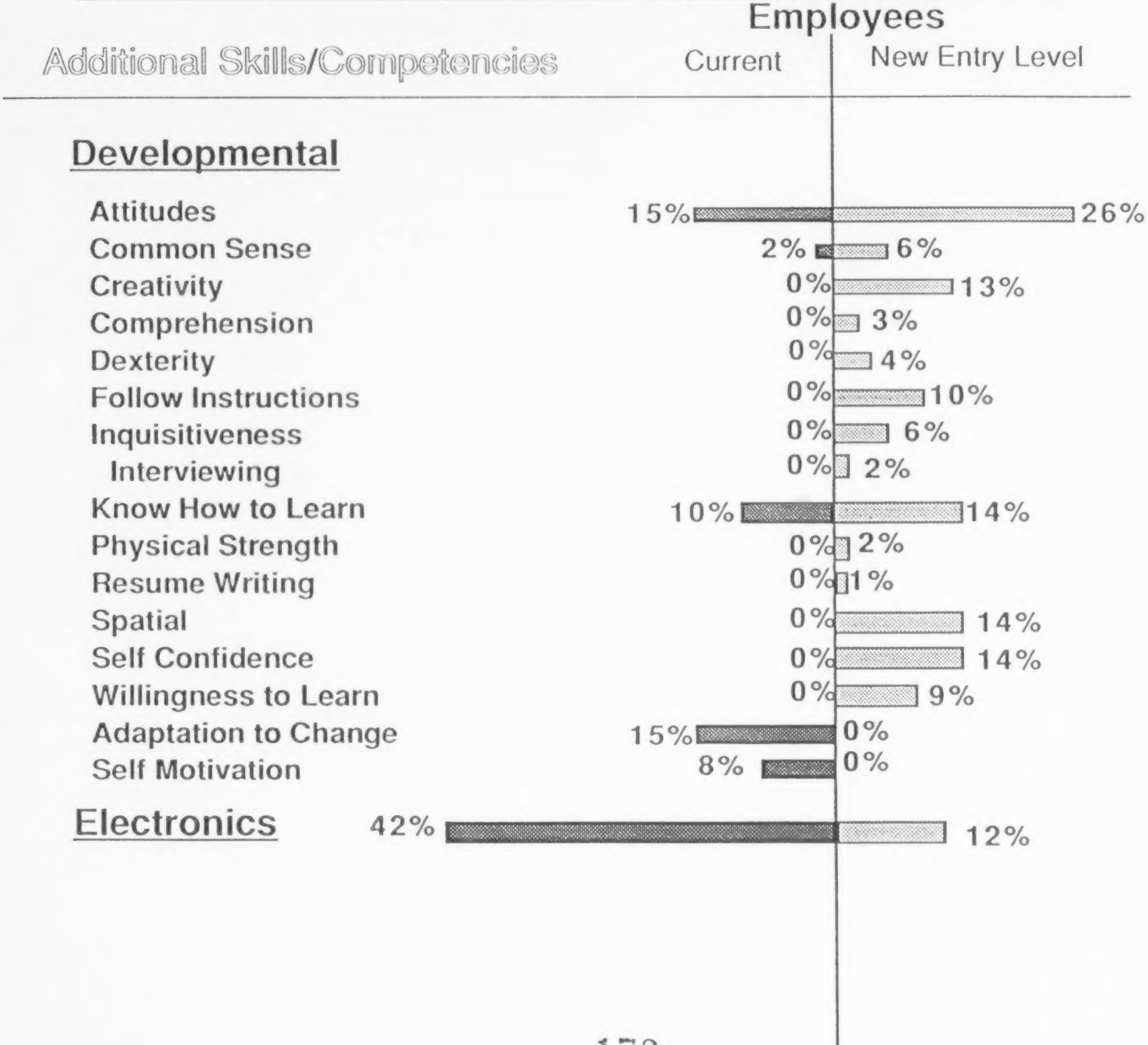
N=103 Survey Period May 1989-January 1990



B/I Interview Survey

New Skills & Competencies Employees Need:
Response to open-ended questions

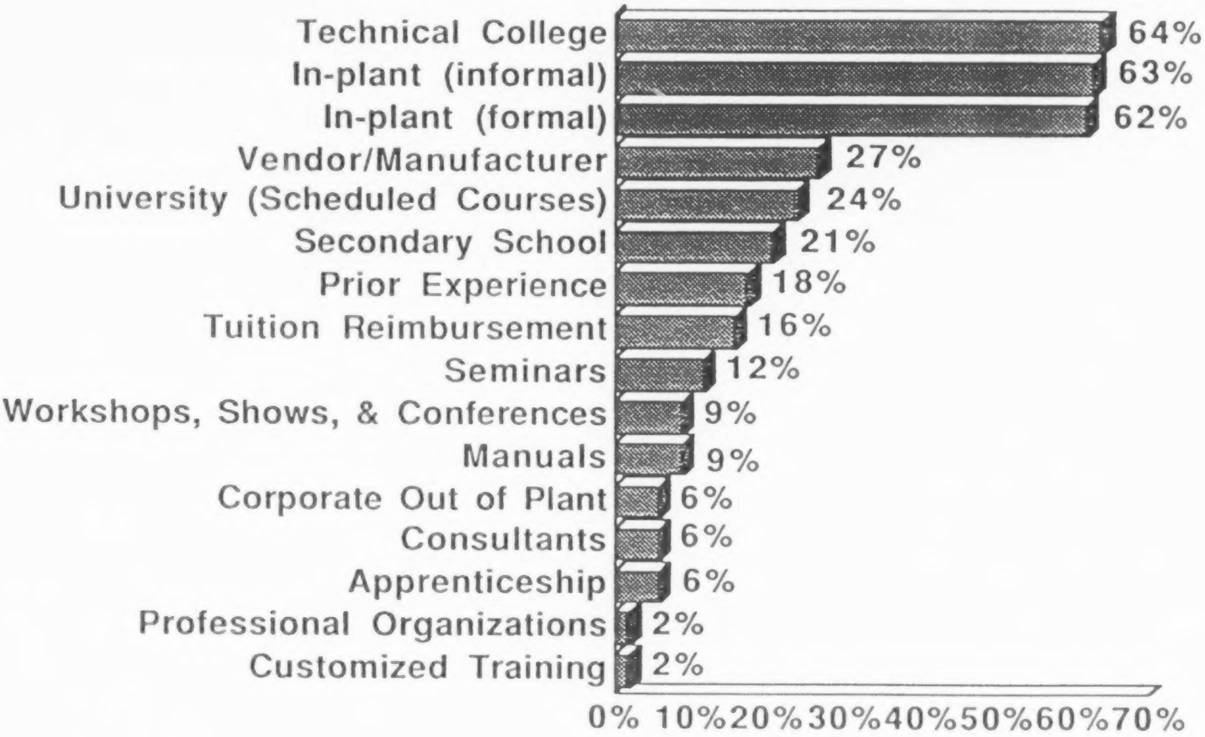
N=103 Survey Period May 1989-January 1990



B/I Interview Survey

Anticipated Sources New Technology Related Skills Training Anticipated

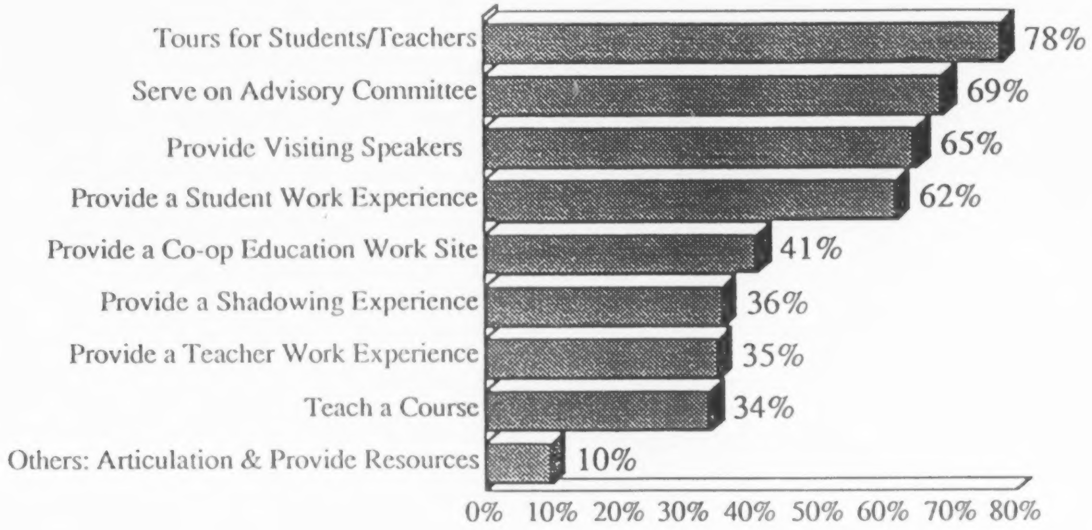
N=103 Survey Period May 1989 - January 1990



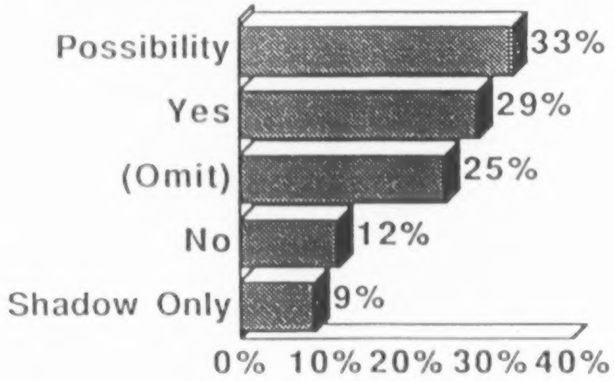
B/I Interview Survey

Involvement

Current or willingness to work with local schools.



Willingness to provide intern experience for teachers.



HIGH TECHNOLOGY TRAINING
MODEL MODULE

Planning and Conducting Follow-Up Studies

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 167

Purpose 167

Objectives 167

Value of Follow-Up Surveys. 168

Planning and Conducting the Follow-Up Survey. 168

References 187

Appendices

A. Sample Size Chart 188

B. Follow-Up Survey Instrument for Former Students 190

C. Employer Survey Instrument Development. 197

D. Reporting of Results. 203

LIST OF FIGURES

Figure 1. Follow-Up Survey Flow Diagram. 170

Figure 2. Cover Letter Content 176

Follow-Up Study

Introduction

This module describes the procedures and actions required to plan and conduct a follow-up study. In some instances, the reader is referred to other modules, such as sampling, that are used in planning and conducting the various follow-up surveys. The body of this module describes the steps and procedures needed to plan and complete a follow-up survey. In some instances, additional details have been included in the appendices. Where this is done, the reader will be referred to the appropriate appendix.

Purpose

The purpose of this module is to provide the information, instructions, and procedures required to design and conduct an effective follow-up study.

Objectives

The objectives of this module are to:

1. Identify the situations in which a follow-up study is an appropriate technique to acquire data.
2. Provide information and procedures that will allow the reader to plan and conduct an effective follow-up survey.
3. Provide information and instructions on how to develop a valid survey instrument.
4. Describe how to select a valid sample.
5. Suggest ways to use the survey results.

Value of Follow-Up Studies

The purpose of a follow-up study is to obtain information from graduates, employers and others who have information on your programs in order to improve your school's educational programs and services. The specific types of information desired will dictate the groups to be contacted during the conduct of the study and the types of questions to be included in the follow-up survey instrument. For example, if you are interested in whether your graduates have the competencies needed to make the transition from school to the world of work, you would contact those who have been out of school for one to two years. In contrast, if you are interested in determining how well your programs have prepared graduates for career changes, family life, and other relationships, you would survey those who have been out five to fifteen years. Employers can also provide valuable feedback on graduates.

Planning and Conducting The Follow-Up Study

The starting point in developing a follow-up study is to identify the objectives for the study. The best way to do this is to determine the types of information needed to make your curriculum, instructional, and general program decisions. This information can be obtained by asking teachers, administrators, school board members, and others concerned with your school system what information they need to have. This can be accomplished by interviewing samples of these people or by using focus-group sessions. The focus-group technique is described in working with small groups module. Another useful technique is to record the information needed as you do program and curriculum revisions.

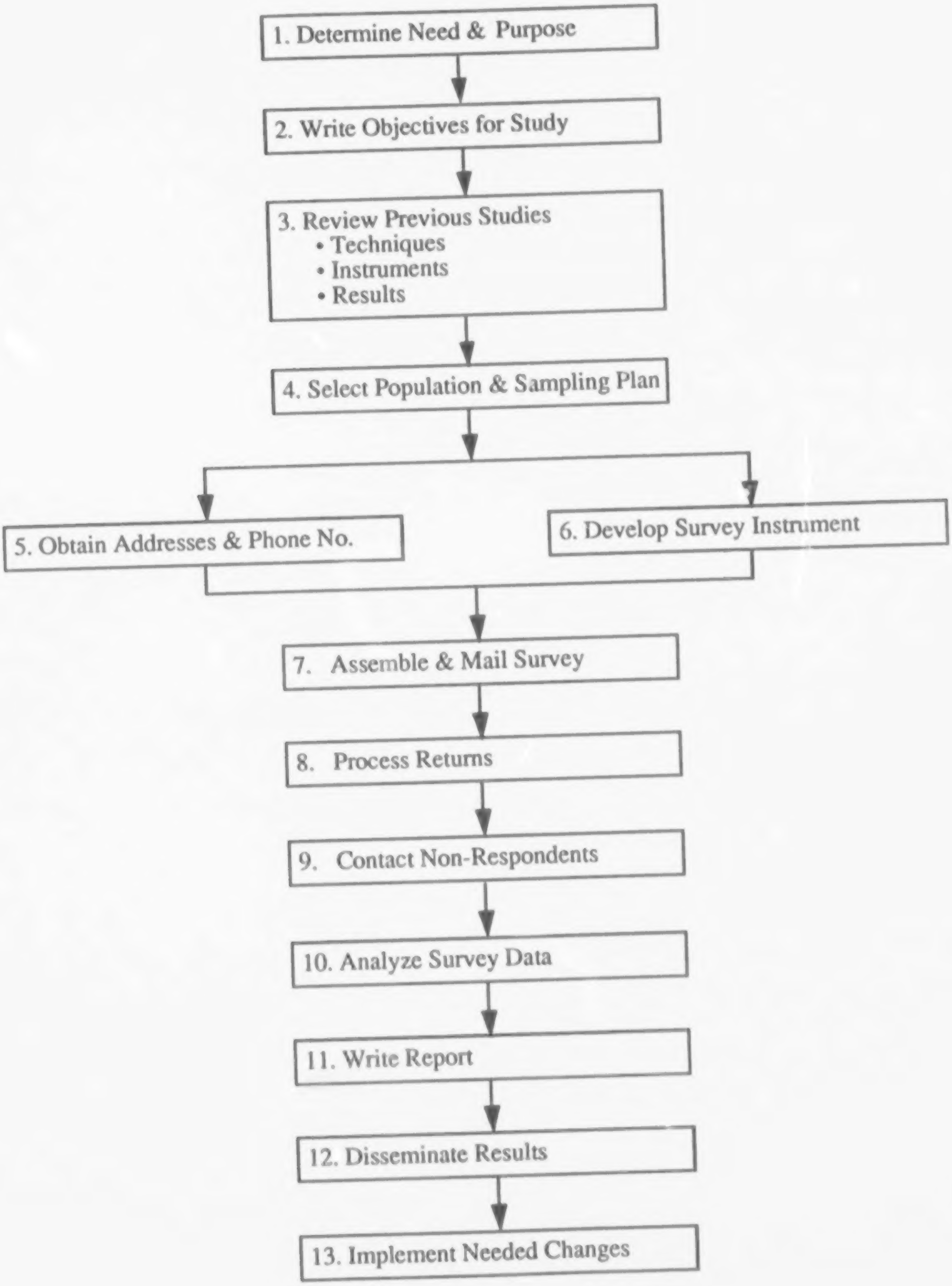
The steps described for the planning and conducting of the follow-up study are depicted in Figure 1. If you have been involved with follow-up studies before, you may wish to look at the flow chart and determine those areas in which you need more information. The procedures in each step are described in this section or in related modules. In some instances, there will also be additional information in the appendix. A logical initial approach would be to read the flow chart and the discussion given for each of the steps in the chart. Then, if you need more information, turn to the appendices and/or the modules.

Determine Need and Purpose

The first step in conducting a follow-up study is to determine why the study should be done. Identify the types of information that are needed to justify and improve your programs and services. Also, review the types of information needed to answer questions about your programs and services. This information will provide the basis for identifying the need and purpose of your follow-up study.

Sources of information can be your school mission statement, teachers, school board members, counselors, parents, and concerned citizens. Input from these sources can be collected informally through conversations with people in these groups and

Figure 1 Follow-up Study Flow Diagram


1. Determine Need & Purpose
2. Write Objectives for Study
3. Review Previous Studies
• Techniques
• Instruments
• Results
4. Select Population & Sampling Plan
5. Obtain Addresses & Phone No.
6. Develop Survey Instrument
7. Assemble & Mail Survey
8. Process Returns
9. Contact Non-Respondents
10. Analyze Survey Data
11. Write Report
12. Disseminate Results
13. Implement Needed Changes

listening to the questions they raise in various forums. Your school's mission statement should be reviewed to determine what objectives are linked to students' transitions into the world of work and/or advanced education. More formal processes such as interviews or focus groups can be used to obtain information from people in these groups.

The purpose of the survey may be very specific and relate only to determining the effectiveness of a specific program or may be more general and concerned with how well your school has prepared its former students for their next stages in life.

Identify Objectives of The Study

After the purpose has been defined, specific objectives need to be developed for the follow-up study. Each objective will identify a specific end product or outcome of the follow-up study. The following is an example of an objective for a follow-up study.

Example: Determine the percentage of graduates that are employed in an occupation related to their school program.

The more precisely your objectives are defined, the easier it will be to develop an appropriate survey instrument. Good objectives also provide the basis for an effective follow-up survey. A review of the needs identified in step one can help to assure that a complete set of objectives is developed. Usually there will be at least one objective for each need identified.

Review Previous Follow-Up Studies

Review any previous follow-up studies conducted in your district. These can be useful in identifying important results, the techniques used, and the types of survey instruments employed. Also, it would be worthwhile to review follow-up studies completed by other school systems and agencies. In these studies, the results may not be as useful as the techniques and instruments used by the researchers.

In addition to previous follow-up surveys, literature on survey research can be helpful. This module gives a practical approach to designing and conducting a follow-up study. It also contains some sample survey instruments and procedures. A more in-depth and varied perspective on survey research can be obtained by reviewing some of the references given at the end of this module.

Select Population and Sampling Plan

Review the purpose of the survey and identify the most appropriate population or populations. A population should be selected because it will give valid information in relation to the purpose and objectives of the survey. For example, if you are interested in obtaining information on the degree to which your students have competency in making the transition to the next level of education or the world of work, it would be most appropriate to identify a population of individuals who have been out of school for one, or at the most, two years. If you are interested in determining how well your graduates make transitions and changes as their careers and personal lives change, you will probably want to select a population for the study of students who have been out of school ten or even twenty years.

Procedures for sampling and selecting appropriate sample sizes are included in the module on sampling. If you need information on sampling, please refer to it. In many instances, a sample will give more accurate information and at less cost than trying to contact and follow-up on everyone in a group. However, you must also consider the public relations value of doing a follow-up survey. It may be worthwhile to contact all of the students from a particular class. This contact indicates an interest in them and their opinions. A sample size chart is included in Appendix A.

Obtain Addresses and Phone Numbers

The next step of the process is to obtain the addresses of the people who will be contacted. If a telephone survey is to be conducted, you will need telephone numbers. Usually there will be the need for a follow-up of a sample of non-respondents. In this activity, you will probably need to call the people selected for contact. Therefore, telephone numbers will be important even though the majority of your contacts will be done by mail.

Often it is hard to obtain good addresses for a follow-up survey. If you are doing a one-year follow-up survey, you may be able to contact family and friends of the former students. Also, ask coaches, teachers, and staff for information on addresses.

When a five or ten-year follow-up survey is being conducted, it is more difficult to obtain valid addresses. Some groups have an active reunion committee that keeps an updated list of addresses. Check to see if one exists for the class or group that you wish to contact. Also, when students are still in school, inform them of the follow-up survey and encourage them to keep their school informed of their current addresses.

Develop/Select Survey Instrument

For some situations, you may be able to find a survey instrument which exactly fits the objectives of your study. In most instances, you will need to do some modifications to existing survey instruments. A word of caution also needs to be given here. If you want to compare your results with previous follow-up surveys or with those conducted by others, you will need to use basically the same questions as used in the previous survey. This does not mean that you have to use the entire survey instrument; however, the questions on which you want to make longitudinal comparisons need to be the same and the directions for responding need to be the same.

It is usually helpful to review survey instruments used in other follow-up surveys. This process can suggest ways to collect information related to your objectives and provide some actual survey questions. Sample follow-up survey instruments and a cover letter are included in Appendix B. Also if you need more assistance in developing your survey instrument, see the module on Developing Survey Instruments.

Include clear directions on the survey. This first set of directions should orient the reader to the entire instrument. Each section or set of items will probably need more specific directions. Try to keep the items or questions as simple as possible and do not use too many different types of items. This will simplify your survey and require fewer directions.

Two basic types of items can be used in the survey instrument: (a) open-ended and (b) fixed response. Open-ended questions provide an opportunity for the respondents to express their ideas and suggestions. Including some open-ended questions makes the people contacted feel that you are interested in their opinions. The problem with open-ended questions is processing the responses. These will need to be analyzed by the researcher. A computer program cannot be used unless the responses are coded by the researcher. An example of an open ended question is: "How could our school's guidance program be improved?"

Questions with fixed responses can be answered more quickly and processed easier. The answers or responses are pre-coded, and these numbers can be entered in a computer for analysis. This type of question also places the responsibility for selecting an appropriate response on the respondents. Some openness can be added to this type of item by providing an "Other _______" response choice. An example of a fixed response item is given below.

"How do you feel about the courses you took in high school?"

(1)___ Very Satisfied
(2)___ Satisfied
(3)___ Unsatisfied
(4)___ Very Unsatisfied

A survey instrument needs to be accompanied by a cover letter. The cover letter should be on your organization's or school's letterhead and signed by a person the people contacted respect. Typical contents of the cover letter are listed in Figure 2.

Figure 2. Cover letter content

Paragraph 1: Purpose and importance of the study.
Paragraph 2: Convince the reader that his/her responses are important.
Paragraph 3: Note that the responses are confidential and re-emphasize the importance of the study.
Paragraph 4: List a contact person and phone numbers, if there are any questions.
Paragraph 5: Statement of thanks, a closing, and sender's name and title.

If you decide to code or identify the survey respondents, there are several options. One choice is to run an extra mailing label and place it on the survey instrument. An option that gives a sense of more confidentiality is to place a code number on the survey instrument or return envelope. If this is done, mention its purpose in the cover letter.

A final content check should be made before the final draft is typed. This needs to be done to determine the content validity of your survey. Content validity means that the survey items are collecting information that is relevant to the objectives of your study.

Your survey instrument should be duplicated using a high quality printing process. Pastel colored papers such as buff, light yellow, light green, or light blue provide an attractive background for the survey instrument.

If you want to conduct an employer survey, include an item in the survey that asks the respondents to list their employer's name and address.

Assemble and Mail The Survey

The cover letter, survey instrument, and a return envelope will have to be assembled and inserted in the mailing envelope. The mailing label or address will need to be placed on the envelope as well. If the survey also contains the name of the person contacted, care will need to be taken to be sure that the name on the survey matches the one on the envelope.

Depending upon the size of the sample, it may be cost effective to look at some alternative postage rates to use in the mailing. When a large set of surveys is to be mailed, the bulk rate will save considerable postage. However, it does require that the envelopes be placed in zip code order. Also, you must have a bulk mailing permit. Bulk mail does not receive the same priority as first class and therefore, it may take longer to deliver. Also, it will not be returned if the address is incorrect, unless you include, Return Postage Guaranteed or Address Correction Requested. However, you will have to pay the first class rate to have these returned with the address correction.

Including a business reply envelope in the mailing saves expense. Only those surveys returned will incur a postage cost. However, the unit cost on a business reply is higher than regular first class mail. Consult your post office or mail room on the various options available and their costs. Select the one that will be cost effective and also give you the service needed.

When selecting a mailing date, avoid vacation and busy periods. It would be best to mail so that the survey arrives during the Tuesday-Thursday time period. This would avoid the Monday rush and the Friday exit behaviors.

Process Returns

If the survey is coded or contains the name of the person contacted, you will want to record the returns as they come in. Postmarks provide some information on who has returned the survey. Also, monitor the number of surveys received each day. When this number drops significantly and reaches one or two per day, it is time to contact those who have not responded. Also, check the surveys to determine if any coding or editing needs to be done before they are submitted for data processing.

Contact Non-Respondents

I find that it is usually worthwhile to send a second mailing and to include another copy of the survey instrument in this mailing. After the second mailing, you will need to determine if you have enough information. If the return rate is high enough, usually 70 percent or higher, you do not need to make additional contacts with your sample. Additional mailings could be made. However, these probably will not net a large number of responses. At this point, it would be more productive to select a random sample of non-respondents and try to contact them by phone or obtain information about them through their parents or friends. A sample of 15 to 20 would be sufficient. If there is a time constraint, or if it will be extremely costly to contact these non-respondents by phone, a smaller sample could be used. The original survey should provide the base set of questions used in the telephone survey. It may be necessary to reduce this set of questions in order to make it fit within the length of time that is appropriate for a telephone interview (10-15 minutes). If that is the case, select the most critical questions. Information from the telephone interviews should be processed separately. This will allow you to contrast the results from the follow-up of non-respondents with the results from those who completed their mail surveys. If the results are similar, you can generalize your results to the entire population surveyed. If they are significantly different, you will need to adjust the outcomes in order to make them reflect the characteristics and feelings of the entire population. NOTE: If an employer survey is to be conducted, it can be initiated at this point. Sample employer surveys are included in Appendix C.

Analyze Survey Data

The data analysis used should be selected based on the study objectives. For example, if one of your objectives is to determine the percentage of former students that is satisfied with your school programs, the responses to the question related to program satisfaction would need to be summarized and the percentage of students selecting satisfied and dissatisfied responses would need to be calculated.

In some instances, your objectives will require comparisons. For example, an objective concerned with identifying the income differentials between men and women would require a breakout of your data by males and females. Usually this is called cross-tabulation in statistics. Many statistical programs available for analyzing survey data have this capability. Be sure to check with the people who will be doing your data analysis to be sure that the software used will have the capacity to do the analyses you need. Also, ask them to review the printouts with you so you are sure of their contents.

For some questions it will be appropriate to use statistics that indicate the typical response. The mean can be used to identify the typical response on a scale that has equal response units. For instance, the average income of the respondents would be an appropriate application of the mean. Also, if a rating scale format is used to evaluate certain courses or services in your school program, the average response would be a way of determining the level of satisfaction with each characteristic. In Appendix B, statistics appropriate for various types of items are listed.

Another measure of typical value is the median. The median is the point at which one-half of the responses are above and one-half of the responses are below. It can be used in situations where the response intervals are not of equal value. For example, the median level of education would be an appropriate application of this statistic when the survey question asks for the highest degree or level completed.

The mode is the third statistic used to reflect typical value. It is the response choice selected most frequently. The mode is useful in situations where the responses to a question do not form a continuum or scale. For instance, the mode would be the appropriate statistical measure for reporting the city, region or area in which most of your former students now reside.

In some instances it is desirable to report the variability in the responses as well. The range of incomes, for example, may be as interesting as the average income. The range is probably the most commonly used measure of variability. People hear and see the ranges in temperatures each day as they view the weather news on TV. They also have an opportunity to experience the variations in temperature during the day and thus have a sense of what this variability means. The range is the difference between the largest and the smallest values. To illustrate this, suppose that the incomes reported had a high value of $100,000 per year and low value of $8,000 per year. This would have a range in incomes of $92,000. It would indicate that there is a wide range of purchasing capacity in the sample.

Another measure of variability is the standard deviation. It is an indicator of the degree to which individual values vary from the mean of the total set of values. The standard deviation has a more complex formula than any of the statistics mentioned so far. Typically it would be calculated by computer. A standard deviation of zero indicates that there is no variability, in other words, that all of the values are the same. As values spread out from the mean, the standard deviation will become larger. The maximum value a standard deviation can have is one-half of the range of the values.

This has been a brief introduction to basic descriptive statistics. A basic statistics book should be consulted for more indepth information on these statistics and to explore a wide variety of additional statistics available. A more efficient approach may be to consult with a person who specializes in statistical analysis. This individual can quickly suggest the appropriate types of statistics and statistical analyses that would be appropriate for your objectives.

One last suggestion. Include statistical analyses that will be understood by your audience. It may be necessary for you to have more sophisticated analyses run to answer some of your study objectives. However; do not forget to obtain frequency counts, percentages, averages, medians and modes from your computer runs. These will be more meaningful to many of your audiences.

Write Report

Two major factors need to be considered when developing the report or reports from a survey. First, what are the characteristics and information needs of the audience(s) that will receive the report? Second, what are the objectives of the study?

In most situations, there will be several audiences that will have an interest in the survey results. Parents, teachers, administrators, local businesses and industries, and graduates are typical audiences for a follow-up report. There is probably a core of information that will be of interest to most, if not all, of the audiences. Also, there will be some pieces of information that will have special value to specific groups. Before writing any reports, it would be a good idea to look at each of the potential audiences and identify their primary interests and the types of information they can process most readily. After this is done, a specific audience can be selected and the report writing can be initiated.

Many audiences are concerned about the outcomes of the study and are not as interested in the details on how the study was conducted. For these audiences, report the major outcomes first. Place those items of greatest interest first in the report. Write in a conversational style. A paragraph or two at the end of the report can be devoted to some of the major details of how the survey was conducted and who was involved in the survey.

You will probably need to do a more formal report of the results also. For one thing, this is valuable for the historical records of your school or agency. The formal report should contain the following sections: (a) Cover Page, (b) Abstract, (c) Table of Contents, (d) Part I - Purpose and Objectives, (e) Part II - Review of Previous Research, (f) Part III - Survey Methodology, (g) Part IV - Results, (h) Part V - Recommendations, (i) References, and (j) Appendices.

Disseminate Results

Usually, people who conduct follow-up studies do not disseminate the results. Thus, a proactive approach is important. Identify the groups and individuals who could profit by learning more about the results of your study. Then try to identify ways and situations in which the results can be presented to them. If possible, make a presentation to the group.

Visual aids that present key results are also helpful. A brief handout that contains the major results presented provides an effective supplement to the presentation.

Sample brochures that reports the results of the follow-up study and a composite report for all high schools participating in the High-Technology training Model Project are included in Appendix D. The brochures present the major findings in a concise and attractive format. A copy of the brochure can be included in mailings to parents, taxpayers, and other interested groups.

Do not overlook distributing your results to local media. Often local newspapers, radio stations and television are interested in information such as you have in your follow-up report. Contact the paper or station and talk to the reporter who will present the results.

Be sure to share the results with teachers, counselors and administrators. Also, some of the results will be relevant to current students.

These have been some suggestions and ways to disseminate the results. Use your creativity to identify dissemination strategies that will effectively reach people who need to know about your programs. Do not be afraid to try something different.

Implement Changes

One of the most effective ways of implementing change is to involve the people who will need to change and make changes in the process of identifying what modifications need to be made in existing courses, programs and services.

Careful attention should be given to the factors and conditions that motivate change. Behaviors that are critical to the change process need to be reinforced. For instance, interest in changing technology could be reinforced with travel funds to visit area industries that are implementing new technology, attend conferences that present new technology, and/or visit school programs that have developed new curriculums.

After your staff has had an opportunity to review the follow-up study results and learn about new programs, they should be involved in discussion groups to identify needs and priorities. Once this has been completed, they can help establish objectives and select strategies to accomplish these objectives.

Resources are also an important part of change. Many good ideas for new programs have been stymied by the lack of resources to implement them. Additional funding is helpful; however, expanding access to community resources can facilitate change. A variety of businesses, industries, and individual talents can be tapped with little or no cost. Talk with local business people to determine how they will help your school.

Often the plan for change gets hung up with the barriers. It is important to identify the objectives, where you need to be, for your programs. After this has been done, brainstorm ways to achieve those goals. Do not let the barriers or problems interfere with the brainstorming process. They can always be factored into your planning later.

References

Bartz, A.E. (1971). Basic Descriptive Statistics. 4th Ed. Minneapolis: Bugess Publishing Co.

Gay, L.R. (1981). Educational Research: Competencies for Analysis and Application. Columbus: Merrill Publishing Co.

Dillman, D.A. (1978). Mail and Telephone Surveys: The Total Design Method. New York: Wiley.

Fink, A. and Kosecoff J. (1985). How to Conduct Surveys: A Step-By-Step Guide. Newbury Park, CA: Sage Publications.

Frey, J.H. (1989). Survey Research By Telephone. Newbury Park, CA: Sage Publications.

Warwick, D.P. and Lininger, C.A. (1975). The Sample Survey: Theory and Practice. New York: McGraw-Hill Book Co.

APPENDIX A

Sample Size Chart

Sample Size Chart

Population Size#	Sample Size	Accuracy*	Population Size#	Sample Size	Accuracy*
25	24	± 5%	1000	278	± 5%
50	44	± 5%	1500	306	± 5%
75	63	± 5%	2000	322	± 5%
100	80	± 5%	5000	357	± 5%
150	108	± 5%	10,000	370	± 5%
200	133	± 5%	50,000	381	± 5%
250	152	± 5%	100,000	384	± 5%
300	169	± 5%	Very	250	± 7%
400	196	± 5%	Large	1000	± 4%
500	217	± 5%	Populations	1500	± 3%
600	234	± 5%			
700	245	± 5%			
800	260	± 5%			
900	269	± 5%			

For populations between the sizes listed, interpolate from the sample sizes given.

* For values near 50% (this is region of largest error).

APPENDIX B
Follow-Up Survey Instrument for Former Students

*Sample Guidelines

*Sample Cover Letter

*Sample One-Year Follow-Up Survey (Form BG-1)

*Sample Five-Year Follow-Up Survey (Form BG-5)

Appendix B

Sample Guidelines for Developing a Follow-Up Survey Instrument

A. Types of Information Collected

- Employment history
- Value and relationship of high school preparation to current job
- Satisfaction with high school courses
- Past high school educational experiences
- Adequacy of high school preparation for life skills and situations
- Adequacy of career planning assistance

B. Appropriate Statistics

(Items from the one-year follow-up survey are used as examples.)

ITEMS	STATISTICS
5-7, 13	frequency (f) and percent
14, 16, & 17	
8, 12, 15	mean or median
19-44	
46	Categorize and tally the responses. Report the category and frequency the response is given.

SAMPLE COVER LETTER

(Place this on your letterhead)

April 3, 1989

Dear Graduate:

Our high school is conducting a follow-up study of graduates in order to determine how effective our courses and services are. As a former student, you can provide valuable information on how well we prepared you for your present activities and responsibilities. The enclosed survey will take about ten minutes to complete. On most of the items you can check your responses. There is space at the end of the survey for you to make comments. We would like to have you include any thoughts or suggestions that you want to add.

All of the information on this survey will be process by computer. Only summaries of the survey responses will be shared with our teachers, administrators, counselors and school board. Your responses will be kept confidential.

If you have any questions, please contact me.

Sincerely yours,

Signature
(Staff Member)
(If possible, have a staff member the graduates know sign the letter)

Enc.

We are presently doing an evaluation of our school district's programs. We want to improve these programs and also wish to determine job and educational preparedness of all graduates. Your honest input will be appreciated.

Student Name
High School

5. (1) ____ Male (2) ____ Female

6. I am presently *(Please check one of these following seven statements.)*
Full-time employed: 32 hrs/week or more;
part-time employed: less than 32 hrs/week.

(1) ____ employed FULL time in a nonmilitary occupation.
(2) ____ employed FULL time in the military service.
(3) ____ employed PART time--not in school.
(4) ____ employed PART time while in school.
(5) ____ full-time student--not employed. *(If checked go to #15.)*
(6) ____ unemployed but looking for paid employment. *(If checked go to #15.)*
(7) ____ unemployed, not looking for paid employment. *(If checked go to #15.)*

7. Do you own or operate your own business?

(1) ____ Yes, full-time
(2) ____ Yes, part-time
(3) ____ No

8. What is your present hourly wage including tips? (Do not include overtime)

$____ __/hour # hours/week ______

If you are not paid on an hourly basis, please respond as follows:

__________ $ amount

____________________ number of hours per pay period

9. (1) Job Title ____________________
(2) Job Duties ____________________
____
(3) Zip code of city in which you work ____________

10. May we contact your supervisor in our Employer Follow-up? (His/her response will be kept anonymous)

(1) ____ Yes ____________________ *(your signature)*
(2) ____ No

11. Supervisor's name: ____________________
Business name: ____________________
Address: ____________________
____

12. Did your high school preparation help you to obtain your present job? *(Check one)*

(1) ____ Considerably
(2) ____ Somewhat
(3) ____ Very little
(4) ____ None

13. Is this job related to your area of high school preparation? *(Check one)*

(1) ____ directly related *(in same job area as high school preparation)*
(2) ____ somewhat related *(using some skills learned in high school courses)*
(3) ____ not related

(For School Use)

1.

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DL	DO
1	2	3

4.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

14. What parts of your high school preparation have been of greatest value in your present job? *(Check all that apply)*

(1) ____ General job skills (work habits, working with others, etc.)
(2) ____ Specific job skills
(3) ____ Career awareness and information
(4) ____ General preparation
(5) ____ English skills
(6) ____ Math skills
(7) ____ Science skills
(8) ____ Computer skills
(9) ____ Other ____________________

15. How do you feel about the courses you took at your high school? *(Check one)*

(1) ____ I was very Satisfied
(2) ____ I was Satisfied
(3) ____ I was UNsatisfied
(4) ____ I was very UNsatisfied

16. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

17. Are you currently attending a school/educational program? *(Check one)*

(1) ____ a GED (High School Equivalency) program
(2) ____ a vocational-technical school diploma program one-year or less
(3) ____ a vocational-technical school two-year associate degree program
(4) ____ a two-year UW-Center program
(5) ____ a four-year university or college program
(6) ____ an apprenticeship program
(7) ____ an in-service or on-the-job training program
(8) ____ private school program
(9) ____ I am not attending school
(10) ____ other ____________________

18. If you checked a school/educational program in #17, please list your current program/area of study.

____
Name of current program/area of study

____
Name of school-location

1	2	3	4	5

CVTAE/HIGH TECH ONE-YEAR FOLLOW-UP SURVEY Form BG-1
(Ill 7294.81-2 - Mod) *Page 2*

In general, how adequate was your high school preparation in the following situations or life skills: *(Please circle number 5, 4, 3, 2, or 1 for each statement.)*

	More Than Adequate		Adequate		Not Adequate
19. Seeking a job	5	4	3	2	1
20. Learning specific job skills	5	4	3	2	1
21. Learning specific job knowledge	5	4	3	2	1
22. Getting along with others	5	4	3	2	1
23. Being able to talk to the boss about your problems	5	4	3	2	1
24. Understanding the value and importance of work	5	4	3	2	1
25. Solving problems	5	4	3	2	1
26. Understanding the U.S. and world economic systems (supply-demand, inflation, recession, etc.)	5	4	3	2	1
27. Understanding how a business makes a profit	5	4	3	2	1
28. Understanding alternatives for solving home and family related problems	5	4	3	2	1
29. Understanding child growth and development and parenting responsibilities	5	4	3	2	1
30. Managing career responsibilities with home and family responsibilities	5	4	3	2	1
31. Applying basic skill preparation in math, reading, writing, spelling, speaking, listening to every day problems	5	4	3	2	1

In general, how adequate was the career planning assistance and information you received at your high school? *(Please circle number 5, 4, 3, 2, or 1 for each statement).*

	More Than Adequate		Adequate		Not Adequate
32. Determining my skills, interests and abilities	5	4	3	2	1
33. Opportunity to hear speakers from the world of work	5	4	3	2	1
34. Presentation of role models in nontraditional areas (i.e., female mechanics/male nurses)	5	4	3	2	1
35. New and/or future oriented occupations	5	4	3	2	1
36. Jobs held by primarily males or primarily females	5	4	3	2	1
37. Occupations which have local job opportunities	5	4	3	2	1
38. Jobs which become outdated, overcrowded or offer no opportunities for advancement	5	4	3	2	1
39. Post-high school educational opportunities related to my career goal	5	4	3	2	1
40. Job alternatives related to my career goal	5	4	3	2	1
41. How to find a job/how to apply for a job	5	4	3	2	1
42. How to start a business	5	4	3	2	1
43. Selecting a career	5	4	3	2	1
44. Adapting to change	5	4	3	2	1

45. What is your home zip code? ____________________

46. *What additional skills and knowledge could you have used as you went from high school to work or further education?*
____
____
____
____

47. Yes ____ No ____ Would you like a copy of the survey summary? If yes, please give your name and mailing address.

Name ________________________________
____
City ________________ State _____ Zip _______

Thank you for responding. Please return this completed survey in the enclosed prepared envelope. Add any additional comments on the back of the cover letter and also return.

CVTAE/HIGH TECH
(HI 7295 B2-1 - Mod)

FIVE-YEAR FOLLOW-UP SURVEY

Form BG-5
Page 1

We are presently doing an evaluation of our school district's programs. We want to improve these programs and also wish to determine job and educational preparedness of all graduates. Your honest input will be appreciated.

Student Name

High School

(For School Use)

1.

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DI	DO
1	2	3

4.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

START HERE

5. (1) ____ Male (2) ____ Female

6. I am presently: *(Please check one of these following seven statements.)*
Full-time employed: 32 hrs/week or more;
part-time employed: less than 32 hrs/week.

(1) ____ employed FULL time in a nonmilitary occupation.
(2) ____ employed FULL time in the military service.
(3) ____ employed PART time--not in school.
(4) ____ employed PART time while in school.
(5) ____ full-time student--not employed. *(If checked go to #15.)*
(6) ____ unemployed but looking for paid employment. *(If checked go to #15.)*
(7) ____ unemployed, not looking for paid employment. *(If checked go to #15.)*

7. Do you own or operate your own business?

(1) ____ Yes, full-time
(2) ____ Yes, part-time/second income
(3) ____ No

8. What is your present hourly wage including tips? (Do not include overtime)

$______/hour # hours/week ______

If you are not paid on an hourly basis, please respond as follows:

__________ $ amount
____________________ number of hours per pay period

9. (1) Job Title ______________________________
(2) Job Duties ______________________________
____
(3) Zip code of the city in which you work __________

10. May we contact your supervisor in our Employer Follow-up? (His/her response will be kept anonymous)

(1) ____ Yes ______________________________
(2) ____ No *(your signature)*

11. Supervisor's name: ______________________________
Business name: ______________________________
Address: ______________________________
____

12. Is this job related to your area of high school preparation? *(Check one)*

(1) ____ directly related *(in same job area as high school preparation training)*
(2) ____ somewhat related *(using some skills learned in high school courses)*
(3) ____ not related

13. Did your high school preparation help you to obtain your present job? *(Check one)*

(1) ____ Considerably
(2) ____ Somewhat
(3) ____ Very little
(4) ____ None

14. What parts of your high school preparation have been of greatest value in your present job? *(Check all that apply)*

(1) ____ General job skills (work habits, working with others, etc)
(2) ____ Specific job skills
(3) ____ Career awareness and information
(4) ____ General preparation
(5) ____ English skills
(6) ____ Math skills
(7) ____ Science skills
(8) ____ Computer skills
(9) ____ Other ______________________________

15. How do you feel about the courses you took at your high school? *(Check one)*

(1) ____ I was very Satisfied
(2) ____ I was Satisfied
(3) ____ I was UNsatisfied
(4) ____ I was very UNsatisfied

16. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

17. Since leaving high school, *(Check all that apply)*

(1) ____ I have received one or more job promotions
(2) ____ I have changed jobs one or more times
(3) ____ I am doing the same work that I did immediately following high school graduation

18. Since leaving high school, I have completed or am presently enrolled in: *(Check all that apply)*

(1) ____ a GED (High School Equivalency) program
(2) ____ a vocational-technical school diploma program one-year or less
(3) ____ a vocational-technical school two-year associate degree program
(4) ____ a two-year UW-Center program
(5) ____ a four-year university system or college program
(6) ____ an apprenticeship program
(7) ____ an in-service or on-the-job training program
(8) ____ private school program
(9) ____ I have not taken any additional training
(10) ____ other ______________________________

19. If you checked a school/educational program in #18, please list your most current program/area of study.

____
Name of current program/area of study

____
Name of school - location

1	2	3	4	5

In general, how adequate was your high school preparation in the following situations or life skills: *(Please circle number 5, 4, 3, 2, or 1 for each statement.)*

	More Than Adequate		Adequate		Not Adequate
20. Seeking a job	5	4	3	2	1
21. Learning specific job skills	5	4	3	2	1
22. Learning specific job knowledge	5	4	3	2	1
23. Getting along with others	5	4	3	2	1
24. Being able to talk to the boss about your problems	5	4	3	2	1
25. Understanding the value and importance of work	5	4	3	2	1
26. Solving problems	5	4	3	2	1
27. Understanding the U.S. and world economic systems (supply-demand, inflation, recession, etc.)	5	4	3	2	1
28. Understanding how a business makes a profit	5	4	3	2	1
29. Understanding alternatives for solving home and family related problems	5	4	3	2	1
30. Understanding child growth and development and parenting responsibilities	5	4	3	2	1
31. Managing career responsibilities with home and family responsibilities	5	4	3	2	1
32. Applying basic skill preparation in math, reading, writing, spelling, speaking, listening to every day problems	5	4	3	2	1

In general, how adequate was the career planning assistance and information you received at your high school? *(Please circle number 5, 4, 3, 2, or 1 for each statement).*

	More Than Adequate		Adequate		Not Adequate
33. Determining my skills, interests and abilities	5	4	3	2	1
34. Opportunity to hear speakers from the world of work	5	4	3	2	1
35. Presentation of role models in nontraditional areas (i.e., female mechanics/male nurses)	5	4	3	2	1
36. New and/or future oriented occupations	5	4	3	2	1
37. Jobs held by primarily males or primarily females	5	4	3	2	1
38. Occupations which have local job opportunities	5	4	3	2	1
39. Jobs which become outdated, overcrowded or offer no opportunities for advancement	5	4	3	2	1
40. Post-high school educational opportunities related to my career goal	5	4	3	2	1
41. Job alternatives related to my career goal	5	4	3	2	1
42. How to find a job/how to apply for a job	5	4	3	2	1
43. How to start a business	5	4	3	2	1
44. Selecting a career	5	4	3	2	1
45. Adapting to change	5	4	3	2	1

46. What is your home zip code? ____________________

47. *What additional skills and knowledge did you have to learn in order to keep up with changes in your job.*

____

____

____

48. *Additional skills or knowledge you will need to learn in the near future in order to keep up with changes in your job.*

____

____

____

49. Yes ____ No ____ Would you like a copy of the survey summary? If yes, please give your name and mailing address.	Name ____________________ ____________________ City ____________ State ____ Zip ________

Thank you for responding. Please return this completed survey in the enclosed prepared envelope. Add any additional comments on the back of the cover letter and also return.

APPENDIX C

Employer Survey Instrument Development

*Employer One-Year Follow-Up Survey (Form C1)

*Employer Five-Year Follow-Up Survey (Form C2)

Appendix C

Employer Survey Instrument Development

(Based on the Wisconsin Secondary Vocational Program
Evaluation Employer Form.)

Types of Information Collected

- Occupational Competencies
- Basic Skills
- General Occupational Competencies
- Linkages With Schools
- New Technologies Coming Into the Workplace

CVTAE/DPI
III 7297 C1-1

EMPLOYER - ONE-YEAR FOLLOW-UP STUDY
Secondary Vocational Program Evaluation

Form C1
Page 1

Dear Supervisor/Employer,

We are in the process of evaluating our school district's vocational programs and have received written waiver from your employee to contact you. Since this will provide valuable data for our district with respect to program improvement as well as job and educational preparedness of graduates your honest input is vital. Your cooperation will be appreciated. No student, employer or identifiers will be presented in our reports. Start with item 7.

Employee
High School
Area of High School Vocational Preparation

(For School Use)

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DL	DO

4.

Male	Female
Graduate	

5.

FT	PT
Graduate	

6.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

Please rate the individual in the following areas: ***(Circle the appropriate responses)***

START HERE

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)
7. Occupational knowledge	5	4	3	2	1
8. Occupational skills	5	4	3	2	1
9. Work attitude	5	4	3	2	1
10. Work quality	5	4	3	2	1
11. Work quantity (amount produced)	5	4	3	2	1

In the following areas of basic skills, how well prepared was this employee? ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
12. Reading	5	4	3	2	1	0
13. Spelling	5	4	3	2	1	0
14. Computer literacy	5	4	3	2	1	0
15. Math	5	4	3	2	1	0
16. Science	5	4	3	2	1	0
17. Writing	5	4	3	2	1	0
18. Speaking	5	4	3	2	1	0
19. Listening	5	4	3	2	1	0
20. Problem solving	5	4	3	2	1	0

Please rate this employee on each of the characteristics listed below. ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
21. Use of tools and equipment.	5	4	3	2	1	0
22. Selection and care of space, materials, and supplies.	5	4	3	2	1	0
23. Ability to work with co-workers	5	4	3	2	1	0
24. Accepting advice and supervision	5	4	3	2	1	0
25. Working in a leadership role when applicable	5	4	3	2	1	0
26. Understanding the value and importance of work.	5	4	3	2	1	0
27. Prompt and dependable in attendance.	5	4	3	2	1	0
28. Willing to accept and perform tasks.	5	4	3	2	1	0
29. Ability to plan and direct own work.	5	4	3	2	1	0
30. Ability to make sound decisions	5	4	3	2	1	0
31. Shows consideration and kindness towards others.	5	4	3	2	1	0
32. Neat, clean, and appropriate appearance.	5	4	3	2	1	0
33. Flexibility to accept change	5	4	3	2	1	0
34. Ability to learn new job tasks.	5	4	3	2	1	0

35. What is your overall rating of this individual's occupational competence as it relates to his/her job?

(5) ____ Very Good
(4) ____ Good
(3) ____ Acceptable
(2) ____ Poor
(1) ____ Very Poor

36. How would you rate this employee's preparation in relation to other employees in his or her work group?

(3) ____ Individual is better prepared
(2) ____ Both are about the same
(1) ____ Individual is less prepared
(0) ____ No basis for comparison

37. What has been this employee's attitude toward on-the-job training?

(5) ____ Very positive, eager to learn
(4) ____ Positive, willing to learn
(3) ____ Acceptant, but needs prodding
(2) ____ Negative, resists training
(1) ____ No training has been offered

38. If the opportunity should arise, would you promote this employee?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

39. When hiring recent high school graduates, would you prefer to hire persons who have had high school vocational training?

(3) ____ A good deal of preference
(2) ____ Some preference
(1) ____ No preference

40. Do you feel vocational courses including career exploration and the development of saleable job skills should be part of the high school program?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

41. In which of the following ways does your business work with secondary schools to support education? *(Please check all that apply)*

(1) ____ Suggesting new vocational courses
(2) ____ Recommending equipment and materials to be used
(3) ____ Providing equipment/materials/donations
(4) ____ Providing facilities
(5) ____ Providing vocational students with work experience
(6) ____ Serving on advisory committees
(7) ____ Providing teachers with work experience
(8) ____ Releasing employees to teach vocational courses
(9) ____ Partnerships

Please comment on:

(1) Additional skills you feel are needed by graduates

(2) How high school vocational programs could be improved

(3) What new technologies are coming into your work place

CVTAE/DPI | EMPLOYER - FIVE-YEAR FOLLOW-UP STUDY | FORM C2

III 7298.C2-1 | Secondary Vocational Program Evaluation | *Page 1*

Dear Supervisor/Employer,

We are in the process of evaluating our school district's vocational programs and have received written waiver from your employee to contact you. Since this will provide valuable data for our district with respect to program improvement as well as job and educational preparedness of graduates your honest input is vital. Your cooperation will be appreciated. No student, employer or identifiers will be presented in our reports. Start with item 7.

Employee
High School
Area of High School Vocational Preparation

(For School Use)

IPC	SEQUENCE	GE

2.

AG	BE	HO	HE	ME	TE
1	2	3	4	5	6

3.

H	DL	DO

4.

Male	Female
Graduate	

5.

FT	PT
Graduate	

6.

AIN	API	BNH	HIS	WNH
1	2	3	4	5

Please rate the individual in the following areas: ***(Circle the appropriate responses)***

START HERE

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)
7. Occupational knowledge	5	4	3	2	1
8. Occupational skills	5	4	3	2	1
9. Work attitude	5	4	3	2	1
10. Work quality	5	4	3	2	1
11. Work quantity (amount produced)	5	4	3	2	1

In the following areas of basic skills, how well prepared was this employee? ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
12. Reading	5	4	3	2	1	0
13. Spelling	5	4	3	2	1	0
14. Computer literacy	5	4	3	2	1	0
15. Math	5	4	3	2	1	0
16. Science	5	4	3	2	1	0
17. Writing	5	4	3	2	1	0
18. Speaking	5	4	3	2	1	0
19. Listening	5	4	3	2	1	0
20. Problem solving	5	4	3	2	1	0

Please rate this employee on each of the characteristics listed below. ***(Circle the appropriate responses)***

	Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
21. Use of tools and equipment	5	4	3	2	1	0
22. Selection and care of space, materials, and supplies	5	4	3	2	1	0
23. Ability to work with co-workers	5	4	3	2	1	0
24. Accepting advice and supervision	5	4	3	2	1	0
25. Working in a leadership role when applicable	5	4	3	2	1	0
26. Understanding the value and importance of work	5	4	3	2	1	0
27. Prompt and dependable in attendance	5	4	3	2	1	0
28. Willing to accept and perform tasks	5	4	3	2	1	0
29. Ability to plan and direct own work	5	4	3	2	1	0
30. Ability to make sound decisions	5	4	3	2	1	0
31. Shows consideration and kindness towards others	5	4	3	2	1	0
32. Neat, clean, and appropriate appearance	5	4	3	2	1	0
33. Flexibility to accept change	5	4	3	2	1	0
34. Ability to learn new job tasks	5	4	3	2	1	0

35. What is your overall rating of this individual's occupational competence as it relates to his/her job?

(5) ____ Very Good
(4) ____ Good
(3) ____ Acceptable
(2) ____ Poor
(1) ____ Very Poor

36. If the opportunity should arise, would you promote this employee?

(1) ____ Yes
(2) ____ Not sure
(3) ____ No

37. When hiring recent high school graduates, would you prefer to hire persons who have had high school vocational training?

(3) ____ A good deal of preference
(2) ____ Some preference
(1) ____ No preference

38. In which of the following ways does your business work with secondary schools to support education? *(Please check all that apply)*

(1) ____ Suggesting new vocational courses
(2) ____ Recommending equipment and materials to be used
(3) ____ Providing equipment/materials/donations
(4) ____ Providing facilities
(5) ____ Providing vocational students with work experience
(6) ____ Serving on advisory committees
(7) ____ Providing teachers with work experience
(8) ____ Releasing employees to teach vocational courses
(9) ____ Partnerships

Please comment on:

(1) Additional skills you feel are needed by graduates

____

____

(2) How high school vocational programs could be improved

____

____

(3) What new technologies are coming into your work place

____

____

Thank you for responding.

APPENDIX D

Reporting of Results

- Wausau West Five-Year Follow-Up Survey
- School Wide Composite Five-Year Follow-up Survey

Project Overview

The High-Technology Training Model Project is funded as a Cooperative Demonstration Program by the Department of Education. The project will develop a model for effectively identifying high-tech training needs of business and industry, and isolate competencies that are relevant to secondary and postsecondary curriculums to correspond with the appropriate needs of business and industry.

The enclosed comments are based on the results of the follow-up study you responded to for your high school.

If you have any questions please contact Tim Mero, Research Associate, High Technology Project (715) 232-3793, or the Local Vocational Education Coordinator (LVEC) at your high school.

The following are the most significant skills or knowledge the respondents have had to learn in order to keep pace with changes in current job requirements (percent of respondents is indicated).

#47: 18% - interpersonal skills
14% - communications
14% - computer skills
14% - business management

The following are skills or knowledge the largest percentage of respondents indicated they must learn in the near future to keep up with anticipated changes.

#48: 35% - advanced computer
30% - basic computer
26% - interpersonal relations

Non-Profit Organization
U.S. POSTAGE
PAID
Menomonie, Wisconsin
Permit No. 3

High-Technology Training Model Project
University of Wisconsin-Stout
218 Applied Arts Building
Menomonie, WI 54751

Wausau West Five Year Follow-Up Study

Results

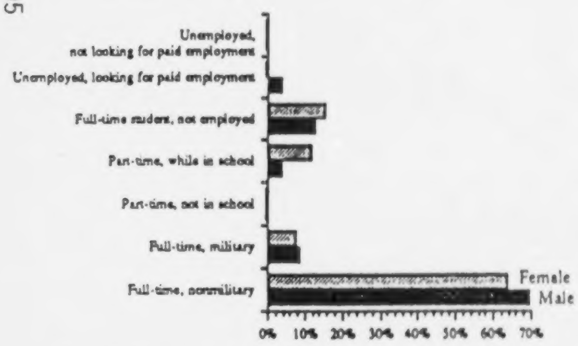
This Survey was conducted during the spring/summer of 1989 by the center for Vocational, Technical and Adult Education as part of the Cooperative Demonstration Research to implement a High-Technology Training Model for Rural Based Business and Industry, Technical Colleges, and Local and State Educational Agencies under Grant No. V199A90151.

Center for Vocational, Technical &
Adult Education
University of Wisconsin-Stout
Menomonie, WI 54751

Wausau West
5 Year Follow-Up

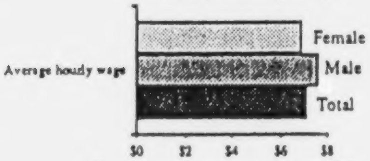
Male	49%
Female	51%
Total participants	47

☞ Present Employment.



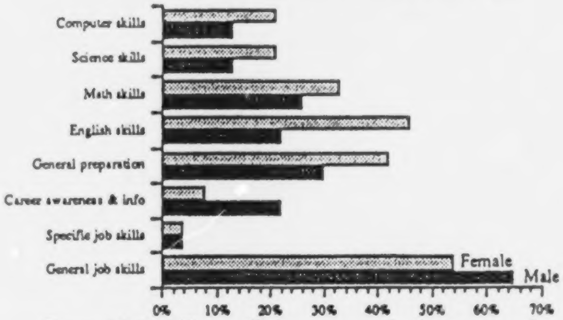
77% are working full-time and 14% are still in school.

☞ Average hourly wage.



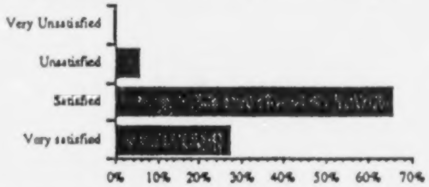
Total average wage is $7.22.

☞ The parts of high school preparation that have been of the greatest value in their job.



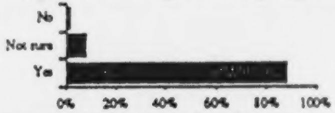
General job skills, at 60%, were rated of greatest value.

☞ How do they feel about the courses taken at high school?



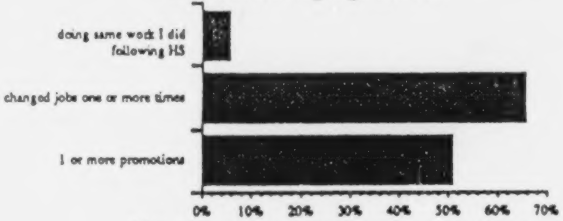
94% were satisfied with high school courses.

☞ Asked if vocational courses including career exploration and the development of saleable job skills should be part of the high school program.



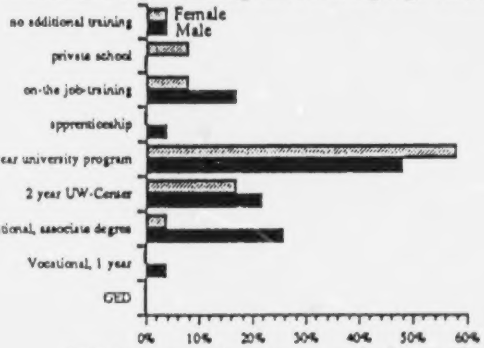
89% of the students felt vocational courses should be part of curriculum.

☞ Since leaving high school:



66% have changed jobs one or more times.

☞ Education and training since leaving high school.



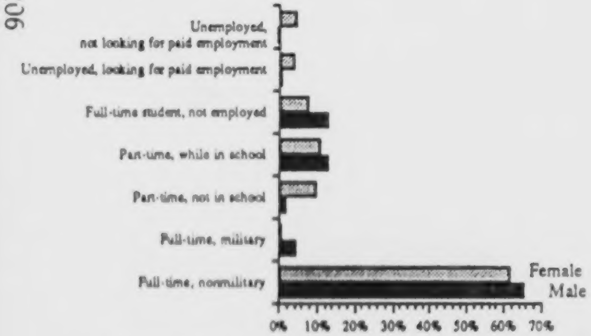
87% have completed or are actively enrolled in a degree program.

5 Year Follow-Up Study

School Wide Composite

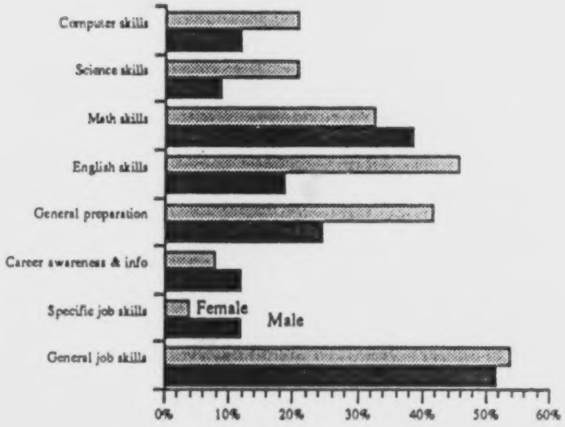
Male	254
Female	284
Total participants	539

☞ Present Employment.



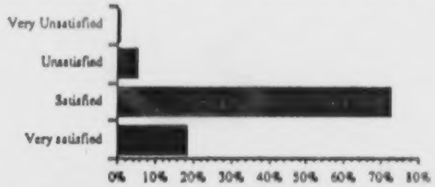
67% are working full-time and 22% are still in school.

☞ The parts of high school preparation that have been of the greatest value in their job.



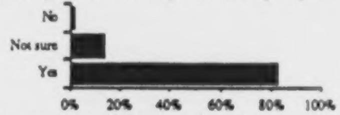
General job skills, at 52%, were rated of greatest value.

☞ How do they feel about the courses taken at high school?



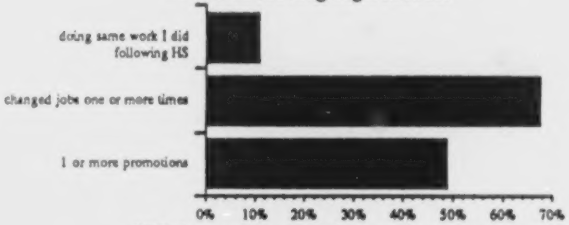
92% were satisfied with high school courses.

☞ Asked if vocational courses including career exploration and the development of saleable job skills should be part of the high school program.



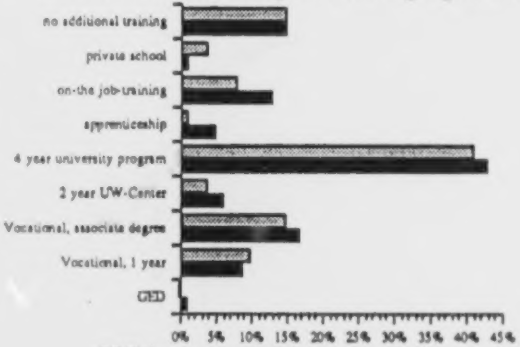
83% of the students felt vocational courses should be part of curriculum.

☞ Since leaving high school:



68% have changed jobs one or more times.

☞ Education and training since leaving high school.



87% have completed or are actively enrolled in a degree program.

HIGH TECHNOLOGY TRAINING
MODEL MODULE

Planning and Conducting
A Delphi Survey

Developed as part of the High-Technology Training Model for Rural Based Business and Industry, Technical College and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
J. Timothy Mero and Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin Stout
Menomonie, Wisconsin 54751

TABLE OF CONTENTS

Introduction. 209

Purpose 209

Objectives. 209

Value of a Delphi Survey. 209

The Delphi Survey Technique 210

Application of the Delphi Survey Technique. 213

Summary 220

Bibliography. 222

Appendices

A. High-Technology Delphi Round 1 Survey Questionnaire. . .224

B. High-Technology Trends Forecasting Survey 226

Part One: Technological Trends 227

Part Two: Work Management and Societal Trends . . .232

C. Sample Letter of Instruction for Round Three 237

D. Survey Report Format 240

E. Decision Matrix. .248

F. High-Technology Training Model Project Trends Forecasting Committee's Prediction of High-Technology Related Trends 251

Introduction

This module describes the procedures and actions required to plan and conduct research using the Delphi survey technique. In some instances the reader is referred to other modules such as Selecting Appropriate Sampling Techniques that are used in planning and conducting the Delphi survey. The body of the module describes the steps and procedures needed to plan and complete a Delphi survey. In some instances additional details have been included in appendices. Where this is done, the reader will be referred to the appropriate appendix.

Purpose

The purpose of this module is to provide the information, instructions, and procedures needed to plan and complete an effective Delphi survey.

Objectives

The objectives of this module are to:

1. Identify the situations in which a Delphi study is an appropriate technique to acquire data.
2. Provide information and procedures that will allow the reader to plan and conduct an effective Delphi study.
3. Provide information and instructions on how to develop a valid survey instrument.
4. Suggest one way of displaying survey results.
5. Suggest how to use survey results.

Value of A Delphi Study

Often research, and education, evaluation, or curriculum specialists are asked to identify, gather and develop information on an issue, trend, problem, or objective which is not completely defined. In other instances the issue, trend, problem, or objective may be clearly understood, but little or no direction is available regarding the recommended action to take or the type of data to collect. In one scenario the intent may be to identify and prioritize the high technology trends an institution must respond to. In a second scenario, the purpose might be to identify and prioritize the high-technology competencies needed for a particular group or those to be emphasized in a program at an institution. Unless prior research has been done and is available for review, one would not have information on the types of trends.

One technique which the writer found to be of value in identifying the trends under these circumstances is the Delphi Survey technique. Application of this technique in the identification of trends will assist in the development of a future oriented perspective for the evaluation and assessment of programs. The writers have found the application of this technique to be equally useful in the development of evaluation and research instruments intended to identify the factors encompassed in a problem area, and the types of questions which may be used to collect data.

The Delphi Survey Technique

The Delphi Survey technique was developed after World War II to provide a process for predicting future events. Since the technique was released to the public, it has been applied in a number of ways for a variety of purposes. Typically, it has been used in one of two ways. Either it has been used to gain consensus on future events or it has been employed to derive consensus on present problems or priorities.

The Delphi Survey technique is designed to collect expert thinking and provide a process for achieving group consensus. The process was designed to minimize the impact of personalities on the thinking and decisions of the surveyed group or jury. The respondents or jury members are selected to provide expertise related to the purpose and subject of the research study. Usually, the first round of the Delphi Survey technique starts with a series of very general questions related to the problem or topic being studied. For example, if a study was being made to predict the nature of our society in the year 2005, one might include a question, "What will transportation be like in the year 2005?" The respondents, as a panel of experts, would then write comments giving their views of the nature of transportation at this future point in time. It is important that the initial questions are of a general nature to avoid inadvertently directing the thinking of the respondent.

Appendix A shows the four questions initially asked of the members of the High-Technology Training Model Project's trends forecasting committee. The purpose of the High-Technology Training Model Project's Delphi Study was the identification of trends in the areas of technology, work management systems and societal issues that would occur by the year 2000. Some argue that the use of these general questions can change the thinking of the jury members; however, some stimulus is needed to direct them to the area being studied.

The responses to the first round of the Delphi Survey technique are analyzed and synthesized into a series of statements related to the problem or topic being studied. Responses are usually identified on a numbered scale which form a continuation (see Appendix B for a sample). These numbered responses are then sent back to the jury members for their evaluation. If one was predicting the likelihood of events at some point in time, the respondents would indicate the probability of occurrence. After the responses in the second round have been given, the researcher summarizes the results and determines the area of consensus on each item. The mean, mode, or median may be used to identify the consensus response depending upon the type of survey and the response scale used. The area of consensus may be determined by the distribution of responses. It could be an area of plus or minus one standard deviation from the mean, or it could be the interquartile range (the area between quartile 1 and quartile 3.) In some research studies, the area of consensus is defined as the category within which the mean, median or mode falls.

For the third round the researcher provides the respondents (jury members) with a summary of the responses from the previous round. Respondents are provided instructions and asked to consider those items on which their responses are not within the area of consensus (See Appendix C for sample of the instructions). For each response which is outside the designated area of consensus, the respondents were given the choice of changing their responses to one which is within the consensus area or of writing an argument for retaining the original response. It is important to emphasize that each of the respondents make their decisions in private and do not know who has made the other responses. Therefore, personalities and reputations have minimal impact. Responses on the third round are then summarized by the researcher.

If a fourth or subsequent round is used, respondents have a choice of modifying their responses which remain out of consensus, by moving them within consensus or to write a counter argument for their continues position of nonconsensus. A high level of consensus is usually achieved by the end of the fourth round. In fact, consensus is usually high after the third round.

Application of the Delphi Survey Technique

When developing instruments under conditions of uncertainty, the researcher may not have the detail and information to specifically determine the contents of the instruments under development. This is analogous to the case where a researcher is attempting to predict the future but is not certain of the events nor the likelihood of their occurrence. Since the Delphi Survey technique has been used successfully in predicting future events and gaining consensus, the writers thought that it would be worthwhile to apply this technique to identify near term technological developments and applications. The results of the survey could then be used in the identification and/or evaluation of competencies which members of the work force must be empowered with in order to contribute socially and economically, adapt to an ever changing work environment, and to be able to influence their own future.

High-Technology Training Model Project

Perhaps it would be easiest to describe the use of the Delphi Survey technique as it was applied to forecast trends as part of the High-Technology Training Model Project. Thirty individuals, each considered an expert in their field, were asked to participate as members of the trends forecasting committee, also referred to as the jury. The intent was to maintain a broad, cross-sectional perspective for committee membership which represented diverse backgrounds, experiences, and interests in lieu of developing an indepth perspective by assembling committee members representing a single occupational field or industry. The committee had a national and regional memberships representing a broad cross section of professional organizations and agencies representing: (1) agriculture and agribusiness, (2) biotechnology, (3) computer software and hardware, (4) curriculum development, (5) economic development, (6) employment (state, national, private), (7) futurists, (8) insurance, (9) marketing research, (10) manufacturing, (11) nuclear energy, (12) organized labor, (13) proprietary and public postsecondary vocational and technical institutions, (14) state and proprietary industrial training agencies, (15) Administrators, of Vocational, Technical and Adult Education institutions/districts, and (16) university faculty members. Their response to the four questions (See Appendix A) asked in the first round of the study produced 254 comments. Each response was typed on a 3 X 5 card for further processing. After the responses had been transferred to cards, the researcher sorted the statements into piles of like statements. Each pile represented a potential statement or set of statements for the instrument to be used in the second round.

Usually, it is difficult to distinguish more than seven to nine categories on one sort. Thus, if a wide variety of comments is received, as was the case in this study, it may be more efficient to identify six to nine piles or categories for the initial card sort. After this has been done, each pile can be further sorted into more specific sub-categories.

After a tentative set of categories or items has been identified, the researcher should review the statements in each pile. Although the statements may vary somewhat within a given pile, they should represent one major thought. In other words, only one major thought or idea should be represented by each pile of cards.

Having verified the homogeneity of the statements in each pile, the researcher can proceed to write the question or statement for the final instrument. Often, a statement can be selected from the pile which is representative of the idea explored. This has the advantage that it will be written in terms understood by the persons who will respond to the next form of the instrument.

In the case of the High-Technology Training Model Project, the researchers painstakenly analyzed each comment, developed categories for grouping comments and synthesized them into 61 trends statements.

Frequently there will be a pattern or several patterns represented by the trend statements developed through this process. In the example used in this module, there were clusters of trend statements dealing with a wide range of subjects that included: artificial intelligence, automated offices, biotechnology, composite materials, computer integrated manufacturing, communication networking, electronics, transportation, world of work, products and services, global issues, government, and economics. However, in most instances, it will be easier to process, analyze and interpret the responses if they are placed in their natural clusters. In order to keep the study manageable, the 62 trend statements were split into two parts. Part one consisted of 32 statements dealing with technological trends. Part two contained the 29 remaining statements in eight clusters in 11 clusters dealing with work management and societal trends. Part one contained four open spaces numbered 33 to 36, for the respondent to write additional trend statements if desired. As a result, the 30 remaining statement trend statements dealing with work management and societal trends, were consecutively numbered in Part two as 37 through 65.

Following the second round of the Delphi Study, a consensus area was identified for each trend statement. Committee members were then asked to review each of their responses which were outside the consensus area and to either change their response (bring it within the consensus area), or justify their position of non-consensus in writing.

The second and third rounds of the Delphi Study was limited to part one. In rounds four and five, the committee addressed the trend statements contained in part two.

Designing the Report Format

Appendix D is a summary of the responses to the 32 technological trend statements which made up part one. The report format depicts:

1. The numbered trend statements.
2. The seven point rating scale for the likelihood of each trend. The scale ranges from:
    - 1 - indicates a 0% likelihood of happening.
    - 7 - indicates a 100% likelihood of happening.
3. The box plot which reflects:
    - (a) consensus area (locating along scale).
    - (b) % of responses within consensus area.
    - (c) non-consensus response area above and/or below consensus area.
    - (d) % of responses in non-consensus above and/or

below consensus area.

(e) range (inclusive) of the responses.

4. Capsulized respondents' comments for justification of non-consensus responses.

   (a) The (+) indicates justification for rating above consensus area.

   (b) The (-) indicates justification for rating below consensus area.

In addition to the capsulized comments, the non-consensus comments were grouped by trend statement, number and reported in their entirety, in a separate part of the actual Delphi study report.

Survey Analysis

In the analysis of the results, a primary concern was to establish consensus or non-consensus for the rating of each trend statement. Consensus was established with the use of a decision matrix (Appendix E) based on the following criteria.

1. Percent of responses within consensus area.
2. Width of consensus area.
3. Range of the likelihood ratings for each statement.

It must be understood that consensus simply establishes the location of the committee's concurrence along the likelihood rating scale for the trend statement.

Trends Forecasting

Appendix F contains the High-Technology Training Model Project Trends Forecasting Committee's prediction of high-technology related trends based on a consensus of 88% or greater on the 7 point likelihood rating scale.

Three major concepts involved in the design and utilization of an instrument are: (1) validity, (2) reliability, and (3) utility.

Validity.

Validity is concerned with whether data collected are related to the decisions or actions to be taken. In the example just cited, two measures of validity were used. First, a content validity check was conducted by contrasting the trends identified in each cluster with the typical trends identified in current literature. This check indicated that the instrument was complete. Second, a concurrent validity check was made. Each respondent had an opportunity to add additional trends in an item labeled "Other."

Reliability.

Reliability can be assessed in different ways. For this study, the consistency of the response patterns was utilized.

Utility.

Utility refers to the degree of effort involved in designing the instrument, collecting the data and making a useful application of the information obtained. Although it does take some lead time in order to query the panel or respondents concerning their reactions to general questions, the amount of time required for each respondent to complete Round 1 is relatively small.

In the High Technology Training Model Project's Delphi Survey, each respondent was asked to write the three or four most important changes they felt will occur in each of the four areas in the next ten years. When the responses were pooled, a wide variety of statements was obtained. With a smaller jury, one might have to ask for more detail. If a large jury is used, fewer responses can be requested for each question. If clerical time is available to pull the statements from the survey forms and place one per 3 X 5 card, the instrument development process goes very quickly. After the statements have been recorded on a card, the sorting process can be done quickly. Since the instrument was designed around a specific problem and the questions in the first form was built on functional area in research, the results were readily useable in designing the second survey.

Summary

Experiences of the writers indicates that the Delphi Survey Technique can be effectively used to identify, gather and develop information concerning issues, trends, problems or objectives which are undefined or instructural. The first round of a Delphi Survey technique can be effectively utilized to identify the specific dimensions of the concept to be measured. The information provides the basis for a series of statements or questions which can be put into the survey instrument for use in the second and subsequent rounds. In situations where the number or diversity of the responses is unmanageable, the survey may be

APPENDIX C

CVTAE
CENTER FOR VOCATIONAL TECHNICAL AND ADULT EDUCATION
715-232-1382

UNIVERSITY OF WISCONSIN
STOUT
MENOMONIE WISCONSIN 54751

July 26, 1990

RE: High-Technology Trends Forecasting Committee

Dear :

The responses for the first round of Part Two (Work Management and Societal Trends) of the delphi survey have been processed. We are now ready to do the second round of this process. In this round you will need to check your response on each item against the consensus response area for the item. To simplify this process, we have identified those items on which your response is outside of the consensus area by circling the statement number in red. If you have any questions on what you are to do, please call us. Your first round survey is enclosed. You will use it as you complete the second round. We would like you to return part two of the survey, using the enclosed envelope, by August 10, 1990. The directions for the second round are given below.

Instructions for Round Two of Part Two

In round two you will need to do the following:

1. Review your survey to identify those items on which your responses are out of the consensus area. These items have been identified with a red circle around the item number.

2. When you find an item number that has been circled, compare your response to the consensus area. The consensus area has been identified with a green box drawn around the response(s) that are included in the consensus area. On an item where your response is outside of the consensus area, you have your choice of two actions:

   a. You may change your response to the consensus area. This can be done by drawing an arrow from your response to the number in the consensus area. If there is more than one response in the consensus area, draw your arrow to the response choice you prefer.

   b. If you do not want to change your response, you must write a justification for your response. Any comments made on your first round have been compiled and lined out on your original to preclude confusion with round two comments. If there is space on your survey by the item, write your justification there. If you wish to use lined out comments from round one as justification, simply circle the comment. If you need more space, we have added an additional form. On that form you can indicate the item number in the left hand column and write your justification in the right hand column. Be sure to list the item number, so we can link the justification to the item.

3. After you have completed the steps above, return your survey form to us in the enclosed envelope.

The consensus areas were determined by selecting the response or response choices that were selected most frequently by the committee. In some instances, there were two adjacent response choices that were selected by the same or similar number of committee members. In this instance, we included more than one response choice in the area of consensus.

After the responses have been received from this second round, we will run a summary of the consensus predictions and send a copy to you. In addition, we will summarize the justifications from each of the surveys and present those along with the statistical summary. These justifications will not be presented by the respondents' name. There will just be a complete list of the justifications for each item. Once this second round is done, you will be able to see what the consensus prediction is for each work management and societal change, and you will also have some justifications for responses that do not fall in the consensus area.

The comments given on the first round survey were appreciated. We are in the process of summarizing these and will provide a summary of them with the overall report that will be sent to you after this round.

If you have any questions on how to complete this second round, be sure to call us (Orville Nelson (715/232-1362, Tim Mero (715/232-3793). If we are not in, leave word with our secretary, and we will call back.

Your input is sincerely appreciated.

Sincerely yours,

Orville Nelson	Tim Mero
Co-Director	Research Associate

Center for Vocational, Technical
and Adult Education
218 Applied Arts Building

bf
Enclosures

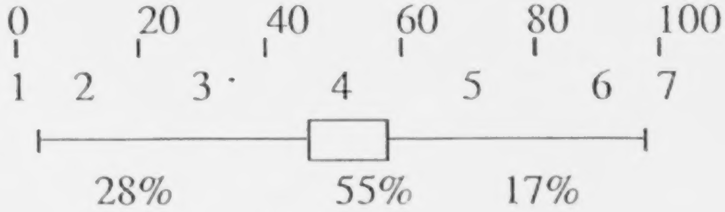
APPENDIX D

Trends Forecasting Committee
High-Technology Delphi Survey
PART ONE: Technological Trends

7. Definitely will happen (100%)
6. Very likely will happen (81-99%)
5. Likely will happen (61-80%)
4. Moderate chance will happen (41-60%)
3. Unlikely will happen (21-40%)
2. Very unlikely to happen (1-20%)
1. Will not happen (0%)

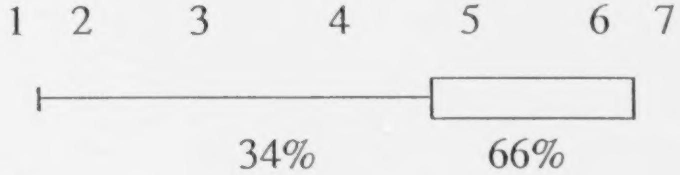
Artificial Intelligence/Expert Systems

1. Expert systems with systematic rules for decision making will decrease the need for technical experts.



Respondent's comments for non-consensus:
+ Reduced role with employee involvement.
- Increase before decrease.
- Yes, but not in 10 years.

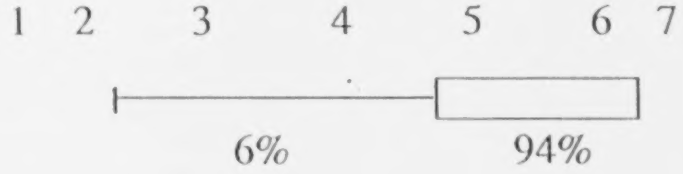
2. User friendly, expert systems will be used in most industry and business fields by 2000.



Respondent's comments for non-consensus:
- Change most to many.
- Yes, but not in ten years.

Automated Office/Datamation

3. The use of electronic data bases with controlled access, will replace conventional record systems in 40% or more of the businesses and industries.



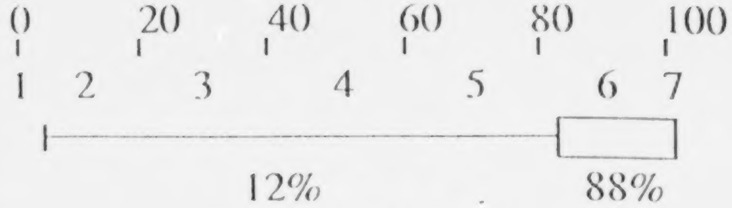
Respondent's comments for non-consensus: - Cost factor is a problem for small businesses.

Note: Respondents' comments for non-consensus

+ indicates comment of respondent rating item above consensus area

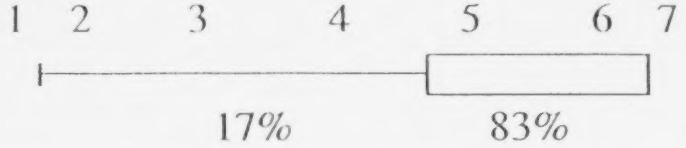
- indicates comment of respondent rating item below consensus area

4. Administrative support staff members will utilize integrated electronic work stations as part of their everyday functions.



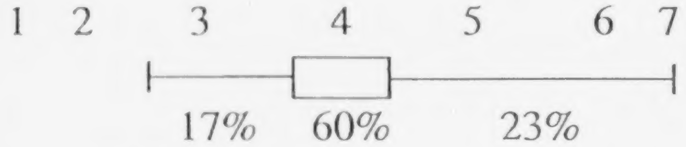
Respondent's comments for non-consensus: - Administrators (now in 40s) won't know how to connect.

5. Impact printers will reach obsolescence by 2000.



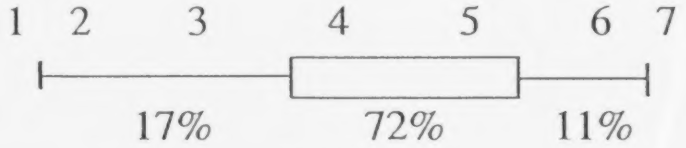
Respondent's comments for non-consensus: Technically obsolete, but many will still be in use.

6. Words-per-minute and keyboarding skills will be abolished as the standard used to identify a person's clerical proficiency.



Respondent's comments for non-consensus: + More likely.
- Never was the standard.

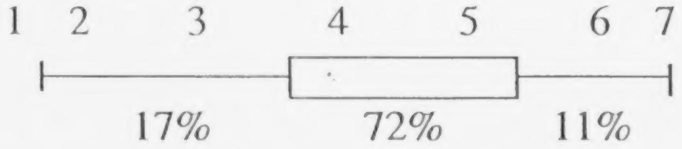
7. At least 50% of the computers on the market will include voice actuation as a standard feature.



Respondent's comments for non-consensus: + Closer than we think.
- Will still be add on.
- % too high.

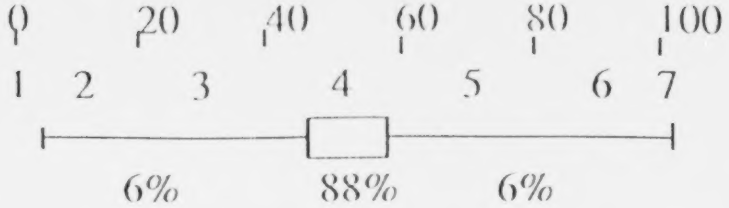
Biotechnology

8. Genetically engineered products to cure AIDS and some cancers will be on the market.



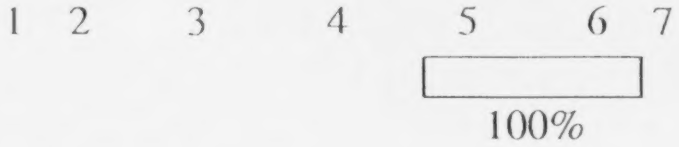
Respondent's comments for non-consensus: + Higher likelihood based on scientific progress.
- Prevention not cure.

9. There will be a 50% increase in the availability of federal support for biotechnology research to develop cures for disabling and life threatening diseases.



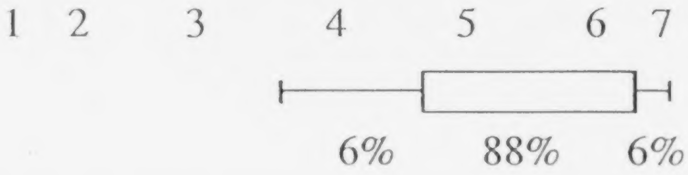
Respondent's comments for non-consensus: + 50% increase is small $ amount.

10. Of the technological advances in science, genetic engineering will be the most controversial.



CAD/CAE

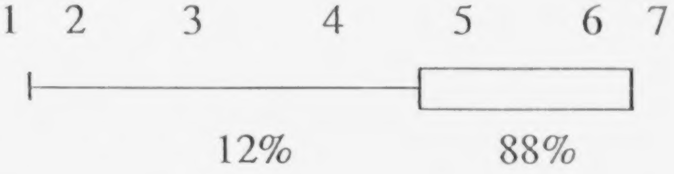
11. Computer assisted design (CAD) will be used for more than 90% of all drafting and design tasks in business and industry.



Respondent's comments for non-consensus: + Without it, companies cannot subcontract.

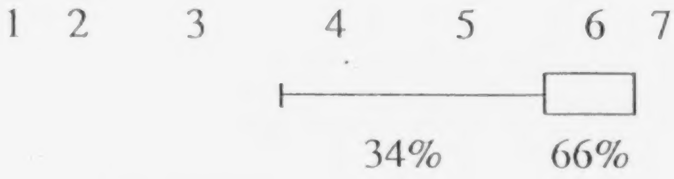
Composite Materials

12. Sixty percent or more of automobile components will be manufactured of composite materials.



Respondent's comments for non-consensus: - % is too high.

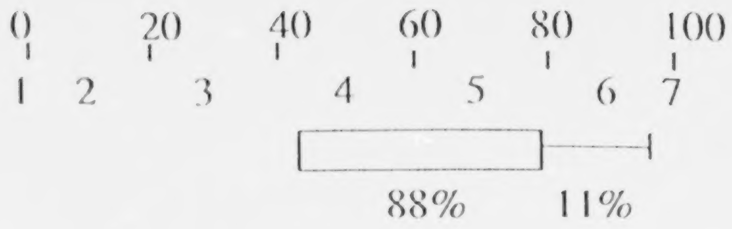
13. By the year 2000, 20 percent or more of the structural steel requirements will be met with composite materials.



Respondent's comments for non-consensus: - 20% is too low.
- Depends on one's definition of structural steel.

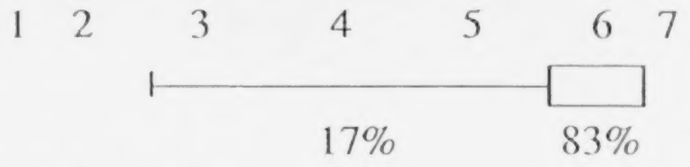
Computer Integrated Manufacturing

14. Smart machines, with self-diagnosing and self-repairing, module replacement capabilities will be on line.



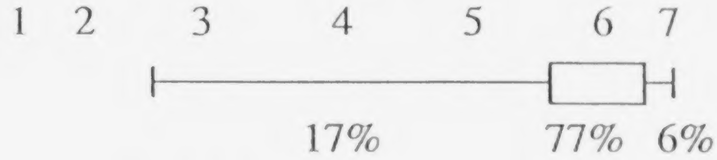
Respondent's comments for non-consensus: + Extent of use will be limited.

15. The Automated Factory, with fully integrated manufacturing, will be a proven operational concept.



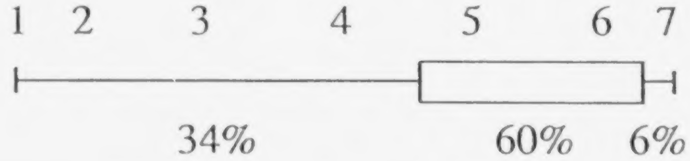
Respondent's comments for non-consensus: - Proven technology, but not accepted in U.S.

16. Visual and contact sensory hardware and software will expand robotic applications.



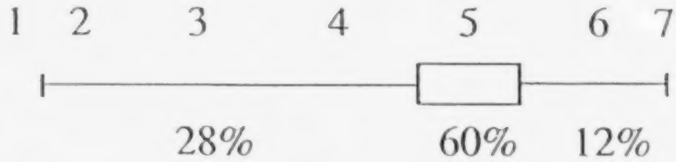
Respondent's comments for non-consensus: + Already beginning.
- Yes, but not in 10 years.

17. At least one space lab devoted to manufacturing in space (i.e., for critical tolerances) will be in orbit.



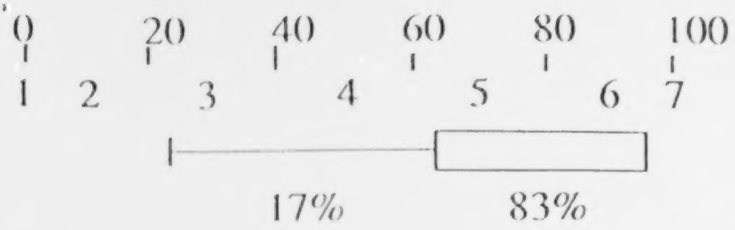
Respondent's comments for non-consensus: + USSR has it now, U.S. will soon.
- 20 years yes, 10 years no.

18. Computer integrated manufacturing (CIM) will be used extensively in 80% or more of the industrialized nations.



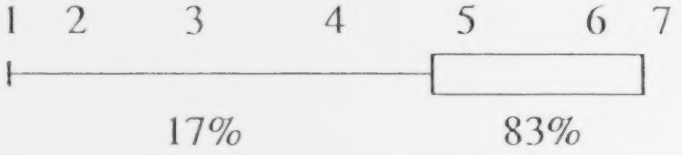
Respondent's comments for non-consensus: - Not in 10 years for extensive use of CIM.
- Yes, but not extensively.

19 Automatic storage and automatic retrieval (AS/AR) systems for parts and components, with controlled access, will be widely used in companies.



Respondent's comments for non-consensus: - Not in 10 years.

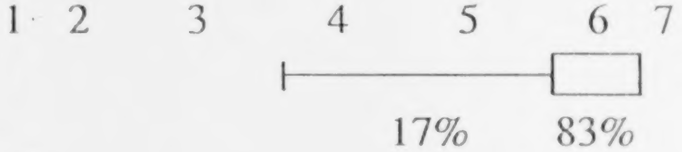
20. Scaled down computer integrated manufacturing (CIM) systems will be in use by 10% or more of the "Job Shops".



Respondent's comments for non-consensus: - Need more education to make these changes.
- Definition of job shop would prevent this.

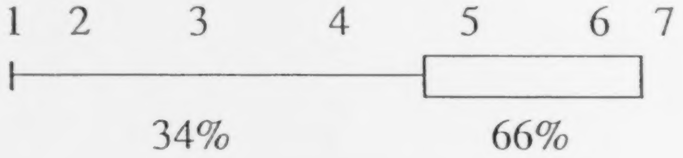
Communication Networking

21. Corporate headquarters will have read only memory (ROM) access to the information and production data bases of their subsidiaries.



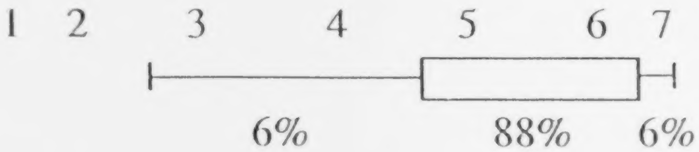
Respondent's comments for non-consensus: + Don't see how major corporation can exist without.
- Large corporation yes, but not for small ones.

22. Ninety percent of all companies will have their communication equipment (electronic mail, facsimile machines, computers, telephones, answering machines, laser scanners, and printers) internally networked as a single, user friendly system.



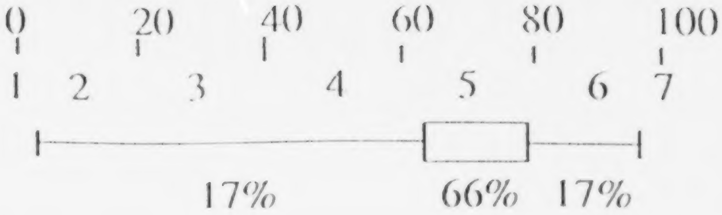
Respondent's comments for non-consensus: - 90% seems too high.
- Too many small companies.
- I would agree for large corporation.

23. A telecommunications link capability will be a standard feature on portable lap-top computers.



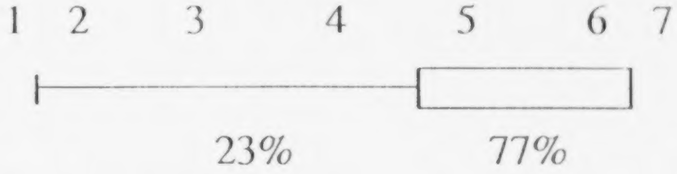
Respondent's comments for non-consensus: + A must; I had it five years ago.

24. Twenty to twenty-five percent of employees will work out of remote locations, linked to their company or corporation through telecommunications.



Respondent's comments for non-consensus:
+ More common than most recognized.
+ Very likely.
- They won't want it as work is a socializing activity.
- Employees want to be around others.

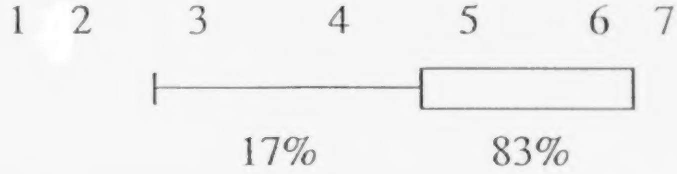
25. Work related travel will be significantly reduced (20-30%) due to improved communication network systems.



Respondent's comments for non-consensus:
- Yes, but not in 10 years.
- Face-to-face is important.

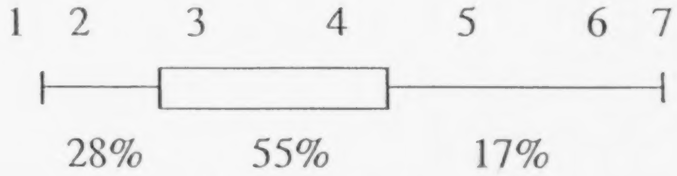
Computer Literacy

26. English will be standardized as the international programming language for voice actuated computers.



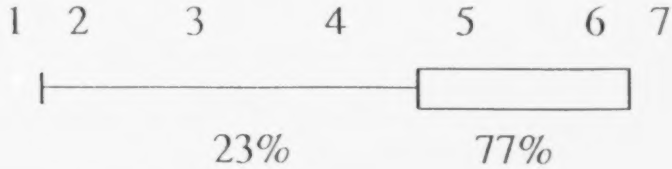
Respondent's comments for non-consensus:
- Not necessary with in line translators.
- Nationalistic interests.

27. Thought actuated computers will have progressed from the development phase to a broad range of field tests.



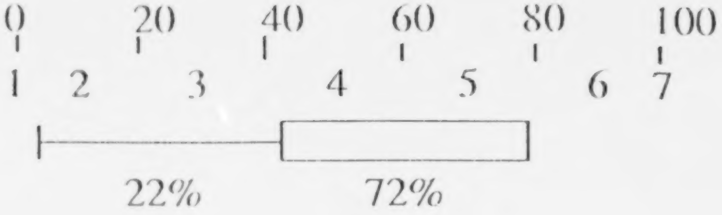
Respondent's comments for non-consensus:
- Can't see widespread application by 2000.
- Yes, but not in 10 years.
- Don't see breakthrough coming yet.
- Only in concept base.
+ This is still only advance research phase.
- 2% now, question 50% in 10 years.

28. Reprogrammable optical (laser) disks will be the most popular media for the storage of permanent and semipermanent records.



Respondent's comments for non-consensus:
- Not in 10 years.
- Not enough knowledge to respond.

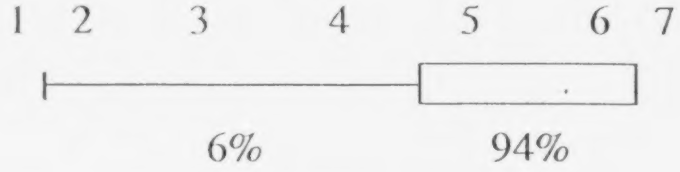
29. Pictures (icons), not speech or characters, will become the computer interface standard.



Respondent's comments for non-consensus: (One omit)
- Not enough knowledge to respond.

Electronics

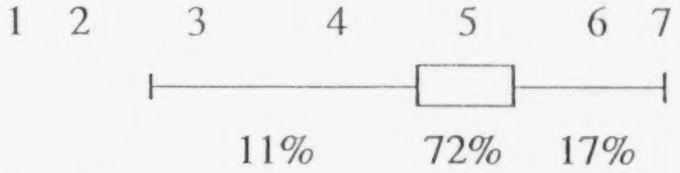
30. International standards will have been adapted for electronic interface technology.



Respondent's comments for non-consensus: - Fast moving, but I can't give to the group view.

Equipment and Facilities

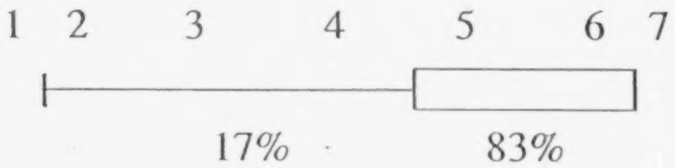
31. The flexible manufacturing facility will be like a hanger or gymnasium, providing optimal diversity, efficiency, economy, and adaptability for changing, multiple long and short term requirements.



Respondent's comments for non-consensus:
- The open concept is less expensive.
+ We have had that for a long time.
+ Highly likely to happen.

Transportation

32. High speed ground transportation will begin to replace short distance air routes.



Respondent's comments for non-consensus:
- Not by 2000 unless begin means testing only.
- They are still talking about them; without federal help, unlikely to be built.

APPENDIX E

Decision Matrix

Trends Forecasting Survey
Consensus Decision Matrix

Consensus Area % within		Increments		Range (Inclusive)	Consensus
100	Yes	1	Yes	1	Yes
		2	Yes	2	Yes
94	Yes	1	Yes	2	Yes
				3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Yes
		2	Yes	3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Yes
88	Yes	1	Yes	2	Yes
				3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Yes
		2	Yes	3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Yes
83	Yes	1	Yes	2	Yes
				3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Yes
		2	Yes	3	Yes
				4	Yes
				5	Yes
				6	Yes
				7	Questionable

78	Yes	1	Yes	2	Yes
				3	Yes
				4	Yes
				5	Questionable
				6	Questionable
				7	No
		2	Yes	3	Yes
				4	Yes
				5	Questionable
				6	No
				7	No
72	Yes	1	Yes	2	Yes
				3	Yes
				4	Questionable
				5	Questionable
				6	No
				7	No
		2	Yes	3	Yes
				4	Questionable
				5	No
				6	No
				7	No
66	Yes	1	Yes	2	Yes
				3	Questionable
				4	Questionable
				5	No
				6	No
				7	No
		2	Yes	3	Questionable
				4	No
				5	No
				6	No
				7	No

APPENDIX F

Trends Forecasting Committee

Trends Forecast
(Part One: Technological Trends)

The Trends Forecasting Committee predicted the likelihood of the following technological trends happening by the year 2000. Forecast are based on a consensus of 88% or greater on a 7 point likelihood rating scale.

1. (Biotechnology) It is likely to very likely (61-99%) that of the technological advances in science, genetic engineering will be the most controversial.

2. (Automated Office/Datamation) It is likely to very likely (61-99%) that the use of electronic data bases with controlled access, will replace conventional record systems in 40% or more of the businesses and industries.

3. (Electronics) It is likely to very likely (61-99%) that international standards will be adapted for electronic interface technology.

4. (Automated Office/Datamation) It is very likely to definite (81-100%) that administrative support staff members will utilize integrated electronic work stations as part of their everyday functions.

5. (CAD/CAE) It is likely to very likely (61-99%) that computer assisted design (CAD) will be used for more than 90% of all drafting and design tasks in business and industry.

6. (Communication Networking) It is likely to very likely (61-99%) that a telecommunications link capability will be a standard feature on portable lap-top computers.

7. (Composite Materials) It is likely to very likely (61-99%) that sixty percent or more of automobile components will be manufactured of composite materials.

8. (CIM) There is a moderate to likely (41-80%) chance that smart machines, with self-diagnosing and self-repairing, module replacement capabilities will be on line.

9. (Biotechnology) There is a moderate (41-60%) chance that there will be a 50% increase in the availability of federal support for biotechnology research to develop cures for disabling and life threatening diseases.

High-Technology Training Model Project
Trends Forecasting Committee

Trends Forecast
(Part Two: Work Management and Societal Trends)

The Trends Forecasting Committee predicted the likelihood of the following work management and societal trends happening by the year 2000. Forecast are based on a consensus of 86% or greater along a 7 point likelihood rating scale.

1. The committee had 100% concurrence that:

   a. (Products and Services: Quality) It is likely to very likely (60-99%) that the philosophy of quality being everyone's responsibility will have a strong influence on corporate human resource development and organizational development programs.

   b. (World of Work) It is likely to very likely (60-99%) that the majority of the labor force will be employed by manufacturing and service oriented business with less than 500 employees.

   c. (Work Skill Development) It is likely to very likely (60-99%) that managers and technics will have to become generalists vice specialists, knowing a little about a lot of areas, to creatively solve problems and be more mobile within organizations.

   d. (Work Skill Development) It is likely to very likely (60-99%) that postsecondary technical education programs will be highly flexible and adjustable to the skill level and learning speed of each individuals.

2. The committee had 93% concurrence that:

   a. (Management) It is very likely to definitely (80-100%) that small businesses and corporations will need to be flexible and responsive to changing consumer needs and demands.

   b. (Work Skill Development) It is very likely (80-99%) that employers will provide more flexible in-house training and education to upgrade the skills of present and new employees.

   c. (Work Skill Development) It is very likely (80-99%) that employees will be required to have expanded basic and technical job skills.

   d. (Global Issues) It is very likely (80-99%) that there will be a 20-30% rise in international trading partnerships.

   e. (World of Work) It is very likely (80-99%) that technological advances will create a shortage of applied technologists with 2 and 4 year degrees.

f. (Work Skill Development) It is likely to very likely (60-99%) that remediation education will be a major function of adult education.

g. (Work Skill Development) It is likely to very likely (60-99%) that educational institutions, and businesses and industries will work as partners with students participating in cooperative programs.

h. (Work Skill Development) It is likely to very likely (60-99%) that postsecondary technical education and training programs will base 80% of their curriculum on local customer needs.

i. (Work Skill Development) It is likely to very likely (60-99%) that problem solving ability will be the leading employability trait.

j. (Management) It is likely (60-79%) that management functions will lean towards services and support coordination.

3. The committee had an 86% concurrence that:

a. (Global Issues) It is very likely to likely (80-100%) that U.S. companies will be held accountable for any ecological damage resulting from production or waste disposal.

b. (Work Skill Development) It is very likely (80-99%) that 80% of all entry-level personnel will have to be computer literate.

c. (Global Issues) It is likely to very likely (60-99%) that the concept of world standards will replace national standards as world economy becomes a reality by the year 2000.

d. (World of Work) It is likely to very likely (60-99%) that out of need, corporations will remove the ethnic, gender, and disability barriers in order to find skilled and/or trainable employees.

e. (Work Skill Development) It is likely to very likely (60-99%) that in education, the understanding of process will dominate the current emphasis on product.

f. (Government) It is likely (60-79%) that federal tax incentives for individuals and corporations will be available for formal education and job related training and retraining.

g. (Products and Services: Quality) There is a moderate to likely (40-79%) chance that Statistical Process Control will be the universal standard (method).

h. (Management) There is a moderate to likely (40-79%) chance that mid-level managers will be replaced by team facilitators who work with the self-management teams in any given segment (department of the corporation).

HIGH TECHNOLOGY TRAINING MODEL

Selecting Appropriate Sampling Techniques and Determining Valid Sample Sizes

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Orville Nelson
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 257
Purpose 257
Objectives. 257
Definitions 258
Types of Sampling 259
Procedures for Selecting a Sample 263

Appendices

A. Random Numbers 266
B. Sample Sizes 277

Sampling

Introduction

Sampling involves selecting a representative sub-set of people, agencies, or businesses from the total group available. Sampling is used for a variety of reasons. It may be very expensive to contact the total population or group. Or, it may be too time consuming to attempt to contact everyone. The alternative is to identify a representative sample and use the time and resources available to obtain information from members of the sample. Research has shown that statistics from a sample are often more accurate than those from the total population. This results from the fact that it is usually possible to do a better job of contacting each person or organization involved in the sample and obtaining the information requested.

Sampling can be a very sophisticated process. However, the basic concepts are logical and not difficult to apply in everyday practice. This module presents these basic concepts and identifies a procedure for selecting samples.

Purpose

This module is designed to provide the information needed to select the appropriate sampling technique and sample size for a study.

Objectives

The objectives of this module are to:

1. Describe basic sampling techniques, and the situations in which they can be most effectively applied.

2. Provide a process for selecting a valid sample size.
3. List the typical steps used to select a sample.

Definitions

Population

The population comprises all of the people, organizations, or agencies that meet the criteria for the total group. For example, if one wanted to measure the career choices of the high school seniors in Wisconsin, the population would be all of the young men and young women who are high school seniors in Wisconsin. For a study of the supervisory training needs of employers, the population might be all businesses and industries which have one or more supervisors. The list of all of the elements or individuals in the population is called the sampling frame. The problem or purpose statement should indicate the appropriate population.

Sampling

A sample is a representative group of individuals or elements from the total population. In the example of the identification of career choice, a sample of high school seniors could be selected. In the study of the need for supervisory training, a sample of businesses and industries could be selected if this population was large. The sample must be representative of the population if the statistics from it are to be used to make generalizations or develop conclusions about the population. Some basic types of samples are described in the following paragraphs.

Types of Samples

Random Sample

The process of selecting a random sample assures that each person or element in the population has an equal chance of being selected. In other words, being selected as a member of a random sample is based purely on chance. One random sampling method with which we are probably all familiar is placing names in a hat and randomly selecting the number of names needed. In this age of the computer, software programs are often used to generate a random sample from a given population. If the names or identification labels for the members of the population are stored in a computer data bank, it is relatively easy to obtain or write a program which will randomly select members from the population and print a list of names, addresses, and/or other data on the members of the sample. The names and addresses may be printed directly on mailing labels or envelopes to facilitate a mail survey. A table of random numbers may also be used to select the members of a random sample. A sample set of random numbers is given in Appendix A.

Stratified Random Sample

In some instances, one may wish to assure that certain groups are adequately represented in the sample. For example, if a survey of local business and industry was being conducted and there were only one or two that were very large, you might miss them in selecting a pure random sample. In order to assure that one or more of these large industries would appear, one could stratify the original population by size of the business or industry and then select randomly within each of these categories. In general, this is the process for selecting a stratified random sample. The purpose of the study will dictate what categories or groupings (strata) are important to be represented in the sample. If there is a possibility that a random sampling process might not select enough people or elements from that group within the population, a stratified random sampling process should be used.

The first step in selecting a stratified random sample is to identify the strata or groupings of interest within the population. After these have been identified, a random selection of members from within each strata or group can be selected. It is possible to change the proportion of members selected from each grouping. For instance, if one has a very small number of members within any given strata, you may wish to select a proportionately larger sample from that group in order to have enough data to develop meaningful statistics. If a sample of high school seniors was being selected, it would probably not be necessary to stratify the population. This population is relatively large and the proportion of males and females is very similar. Therefore, it is likely that a sample drawn from this population would have an almost equal proportion of males and females. In fact, if the proportion of males and females was too disproportionate in the sample selected, one would probably question the sampling technique used.

Sequential Sampling

In some situations you have a sampling frame or long list of names that identifies your population. Selecting a random sample from this list would be a time consuming process and open to errors. An alternative process is selecting names from the list through the application of a sequential interval K, so that every Kth name on the list, following a random start, is included in the sample.

For example, if you need every fifteenth name from the list, randomly select a starting point within the first fifteen names. Then, count off fifteen names from that point and select that person for the sample. This process would be continued until you have gone through the entire list of names (sampling frame.) In this example, if the tenth name was randomly selected as a starting point, you would also be selecting the twenty-fifth, fortieth, fifty-fifth, etc. names from the list. The sample size for this process is determined in the same way as you would determine the sample size for any of the other sampling techniques (See Appendix B). The value of interval K is determined by dividing the size of the population by the desired sample size (N/n=K.)

Cluster Sample

When sampling from existing groups, it is often more appropriate to select a cluster sample. An existing group could be a class section, the people living in a city block, or various office/plant sites for a company. In a school setting selecting a random sample can be disruptive to the educational process. Also, it makes it difficult to administer the survey instruments. When an entire class section is selected, the teacher or researcher can administer the forms to all of the students involved.

When doing community surveys, it may be difficult to obtain a complete listing of the people in a specific area of a city or county. Selecting city blocks or areas can overcome this process.

The process used to select the group or clusters must assure that they are representative of the entire population. For instance, in a school setting some sections may have more students involved in extra-curricular activities, such as, band and athletics. To avoid introducing a bias, the researcher can stratify the groups or class sections and randomly select from the strata. For example, if you had six sections of students in each class in high school, these sections could be stratified based on those that contain students involved in extra-curricular activities and those who are not. There may also be some sections that have a cross-section of students. Once the strata have been identified, the researcher can randomly select the number of sections needed from each strata for the study. Again, the number of sections will depend upon the total sample size needed. If a sample of size fifty is needed and each class section has twenty-five students in it, two sections would be selected for the final sample. If there were two strata, one section would be selected from each strata. If there were three strata, it may be easier to over sample and select three sections.

Judgmental Sample

Another type of sample sometimes selected is one in which the researchers select people or elements from the population which they feel are appropriate for the sample needed in the study. In some instances, this may be a valid sample. If it is necessary to have people who are knowledgeable of a new technology or a particular problem area in order to identify needs related to the area, then a judgmental sample would be very appropriate. If, however, the purpose of the study is to obtain data which can be generalized to the total population, then the judgmental sample is not appropriate. It is usually difficult to prove that a judgmental sample does not have some type of a bias. Worse yet, it is usually impossible to identify the exact nature and impacts of these biases.

Procedures for Selecting a Sample

The following is a general procedure which may be followed in selecting a sample.

1. Review the purpose of the study to identify the characteristics of the appropriate population. List these characteristics.

2. Determine if the population is large enough to justify using a sampling process. If the population has only eight or ten members, it would be more efficient to contact each one. If

there are several hundred, then it would be more appropriate and efficient to use a sample.

3. Determine the level of accuracy needed in the sample. For example, the level of accuracy needed would increase directly as the cost and significance of the impacts of a decision increase. Also, determine whether it is necessary to stratify the population and sample within each strata.

4. Using the information from the previous steps and the study objectives, determine the sample size to select. If there are stratas or sub-groups in the analysis, it will be necessary to determine at which level one wishes to specify the accuracy of the sample. For example, if it is desired to have a specified level of accuracy within each of the strata, then the sample sizes would need to be selected for each strata. If it is adequate to have a specific level of accuracy for the total sample selected, then the sample size would be identified for the total group and pro-rated to each of the strata. See Appendix B for a sample size chart.

5. If a random or stratified random sample is being selected, use one of the processes identified above to randomly select members for the sample. If the members of the population are stored in a computer file, it would probably be most efficient to have a computer program written which would randomly select members from a given population and print out the information needed. This program could then be used any time a sample is needed. When selecting the sample, it is a good idea to

select additional members or names. If it is impossible to contact one of the members of the original list, the additional names can be used to complete the sample.

6. Check the characteristics of the sample against the characteristics of the total population. For example, if the total population is approximately 50% females, the sample should also have approximately 50% females. Other population characteristics such as age, educational level, and occupation may be used for this check.

A Caution

Response rates are not equivalent to sample sizes. For example, if you need a sample size of 100 and expect a response rate of 50%, it is not valid to increase the sample size to 200 in order to assure 100 responses. The 100 responses would give the statistical accuracy needed, but there would be the potential of significant bias in the responses. The problem of less than 100% response rates must be addressed in a different manner. Non-respondents must be contacted and data acquired from them. A follow-up of a sample of non-respondents is needed to assess the nature and magnitude of any biases. The information from this non-respondent group is processed separately and contrasted with the results from the original respondents. Any discrepancies in the response patterns indicate potential biases.

Appendix A - Random Numbers

* Three Digit Numbers for Populations of 999 or Less.

* Four Digit Numbers for Populations of 9999 or Less.

Three Digit Numbers for Population of 999 or Less

168	998	915	188	309	368	59	190	120	406
108	75	467	537	825	231	280	654	349	692
440	955	936	712	744	346	353	35	553	329
936	638	488	48	20	498	282	927	231	693
644	41	893	861	752	183	503	830	722	264
42	969	175	484	574	536	757	448	393	99
218	139	695	796	409	431	491	9	318	550
284	733	986	668	700	683	929	552	93	952
414	920	841	754	706	958	815	552	140	136
272	621	630	278	132	839	975	524	398	254
68	636	191	724	872	803	625	680	768	866
532	804	642	649	745	166	802	800	440	133
612	326	764	77	429	742	741	686	213	501
170	437	916	132	35	501	511	255	625	162
276	396	368	513	674	273	112	994	963	979
333	76	375	224	507	112	487	573	624	176
134	333	593	433	980	530	9	321	601	133
514	610	692	458	757	129	765	412	660	702
426	11	494	599	117	339	994	543	911	863
493	69	735	789	817	792	116	869	414	864
319	842	969	679	491	416	468	626	152	481
466	424	162	959	27	343	9	473	580	361
44	748	670	49	996	432	346	734	909	735
661	229	331	82	521	192	382	680	875	896
59	695	967	965	875	433	149	368	708	725
478	726	460	412	84	721	882	625	48	150
683	262	271	941	784	852	566	149	308	708
963	757	692	63	958	803	5	590	185	158
355	493	763	973	971	86	276	610	341	526
148	604	494	130	873	943	311	448	355	719
447	5	328	944	242	393	594	89	726	132
569	621	573	471	366	606	622	49	396	166
307	91	230	333	133	566	206	603	30	461
1	241	210	120	173	118	885	287	390	643
945	310	846	82	473	649	80	303	691	623
201	760	698	72	240	243	124	343	120	709
541	782	476	231	244	653	311	860	781	148
220	960	305	922	667	291	648	314	555	913
692	181	59	683	416	18	480	914	729	782
571	471	930	595	610	372	430	247	166	674
74	172	317	204	184	312	796	420	176	52
302	456	373	142	949	150	348	275	613	598
940	750	627	521	768	383	94	521	883	596
769	985	894	355	273	214	691	370	105	61
619	742	691	125	716	970	457	297	365	987
662	217	486	663	465	914	110	926	477	708
953	437	762	139	353	487	41	498	673	534
575	230	25	564	952	285	938	177	779	183
322	93	9	367	831	482	371	125	493	301
169	132	222	557	395	406	549	156	933	237
710	790	297	364	923	992	173	472	491	322
721	785	59	329	394	314	170	713	740	52
942	881	437	166	510	786	530	977	564	749
618	284	116	668	471	321	331	798	302	395

59	12	697	8	400	229	918	999	436	414
77	16	964	337	410	354	869	6	635	963
464	446	128	164	939	247	406	382	747	50
147	935	562	899	732	674	154	125	41	30
294	185	996	756	552	635	76	414	586	141
790	401	300	228	850	74	964	154	521	250
156	116	375	142	154	683	460	528	112	142
582	691	145	176	221	438	181	39	279	231
182	166	682	245	107	869	536	882	706	559
344	48	26	656	512	241	225	109	123	238
53	206	720	937	123	81	584	646	812	111
727	867	414	99	610	375	904	942	292	128
419	182	513	324	311	630	944	629	396	972
574	394	738	37	993	393	98	145	27	387
891	708	985	554	271	8	481	590	695	816
587	25	88	289	776	44	448	295	915	872
526	111	275	506	913	153	298	359	673	155
603	91	347	985	477	695	977	6	811	613
468	659	247	457	434	693	987	600	359	203
530	710	705	414	297	7	309	870	891	803
185	449	473	609	595	393	487	865	992	253
727	88	196	433	459	980	911	753	113	804
449	205	753	55	261	815	321	252	640	298
389	368	706	909	906	212	532	681	160	812
9	958	962	580	836	899	768	822	710	377
229	888	610	447	407	991	752	294	635	519
604	346	768	368	44	966	282	597	541	895
497	456	956	375	863	576	328	613	81	883
754	17	520	509	215	373	174	772	975	879
141	5	887	720	361	788	739	596	91	880
489	375	360	887	994	803	382	488	599	929
660	734	700	675	278	744	125	724	596	825
958	645	346	831	155	923	864	287	67	324
932	598	728	762	473	369	519	593	83	645
558	998	131	619	942	897	908	92	684	537
75	750	966	713	368	39	61	253	330	193
36	219	511	713	94	991	414	336	164	138
140	302	101	769	476	453	606	777	923	475
718	147	870	318	495	252	936	594	241	806
171	508	392	901	646	606	906	296	625	396
792	880	333	633	105	984	39	824	554	956
943	236	541	184	103	470	278	476	385	382
317	475	161	905	612	532	265	83	970	205
406	327	503	308	55	735	435	186	520	990
380	623	700	140	948	578	752	323	281	648
661	210	893	951	431	730	909	824	402	367
573	545	915	79	631	958	307	628	936	713
982	883	416	512	35	374	223	552	657	162
707	77	321	809	559	719	472	998	230	36
204	109	491	439	171	775	744	412	698	252
443	700	846	106	725	905	898	546	128	629
515	446	990	119	529	830	891	64	134	400
257	973	925	376	979	309	51	710	645	298
448	470	769	79	891	933	106	629	349	688

916	627	883	804	800	176	60	847	445	65
628	296	406	985	929	661	781	871	293	350
371	294	386	67	718	579	256	311	92	61
556	251	320	662	179	40	41	698	297	356
764	601	522	717	827	974	690	877	122	139
494	331	193	122	952	748	72	725	442	859
950	123	797	110	558	147	679	127	852	181
234	773	377	345	745	370	405	383	790	360
714	424	109	466	618	552	191	142	603	841
306	866	683	284	461	562	333	790	519	211
606	169	472	438	795	769	586	630	759	205
922	866	752	334	453	735	384	402	762	800
62	46	66	296	27	560	43	324	834	599
693	609	909	251	223	613	513	140	690	545
241	981	888	576	914	773	702	291	467	533
930	193	190	256	299	783	451	513	151	537
731	876	56	812	605	66	309	479	12	523
66	835	940	796	598	89	366	944	889	462
75	858	573	715	708	184	941	632	162	254
500	762	182	220	322	481	768	297	160	142
757	780	79	893	679	283	73	428	756	343
908	743	651	334	174	683	323	340	288	821
98	438	915	983	825	530	64	448	709	674
816	629	196	569	455	783	12	622	443	39
216	768	511	805	875	964	829	333	727	33
995	0	934	271	331	607	787	999	713	721
973	976	927	889	764	347	279	239	233	541
947	788	363	309	311	488	656	800	241	825
594	365	77	492	76	501	791	459	676	117
563	475	339	27	751	791	878	364	994	670
364	313	933	962	299	357	780	806	142	940
725	241	586	237	907	288	668	426	448	790
586	671	764	59	821	699	156	128	940	671
404	155	168	759	859	274	609	596	248	944
713	529	201	584	346	346	220	56	587	891
566	271	95	747	327	995	667	910	619	614
337	114	673	445	136	247	292	854	364	10
905	258	985	759	204	780	504	189	107	131
444	286	516	996	266	725	123	975	358	624
228	886	440	335	323	964	498	690	910	258
119	878	802	276	806	868	874	674	672	55
20	524	584	549	779	478	645	284	879	864
612	855	678	502	604	774	234	807	217	550
498	460	911	777	847	701	262	142	962	37
448	32	772	914	87	165	947	656	264	398
186	698	380	661	275	940	169	668	649	740
989	836	951	859	266	580	808	403	669	912
828	558	414	7	532	656	767	166	718	887
637	339	491	686	847	148	934	604	459	51
169	203	247	102	274	274	189	458	314	428
581	560	442	851	137	662	831	774	174	129
903	953	765	677	101	208	432	469	179	817
782	752	751	306	155	451	582	947	174	878
852	991	785	510	383	450	166	474	559	964

591	181	421	56	132	276	184	816	791	822
144	823	432	400	717	832	615	530	98	542
196	603	769	481	302	235	840	812	37	720
964	596	34	993	299	820	706	299	766	234
811	456	572	791	686	419	745	235	261	536
155	143	717	695	269	458	388	257	609	315
269	472	654	709	256	785	676	291	941	205
733	358	616	663	816	810	804	29	871	642
462	212	194	258	682	511	419	652	532	140
98	259	367	600	598	15	743	323	797	939
774	751	829	256	562	783	836	890	34	248
495	851	321	846	768	816	520	707	143	969
460	499	324	865	818	771	122	900	715	919
21	652	627	990	659	167	242	203	205	966
605	892	372	331	676	276	538	169	146	233
226	483	130	995	912	279	95	447	913	418
128	434	811	743	406	272	686	503	482	357
103	891	733	571	619	226	100	884	274	88
957	338	310	443	735	335	98	566	654	888
16	299	670	274	744	945	501	243	234	847
341	727	320	442	616	696	711	348	898	600
856	768	836	568	898	266	703	273	726	713
937	153	837	941	766	392	503	414	788	848
485	954	115	840	254	318	437	470	483	184
112	901	273	827	150	764	354	546	697	610
251	630	370	94	140	416	573	289	883	728
624	326	481	752	333	270	915	140	366	896
129	891	517	812	623	302	752	65	897	43
612	195	735	149	363	362	49	468	984	11
787	886	855	216	124	339	759	639	921	450
553	775	203	299	623	902	115	654	976	908
610	695	579	921	851	22	310	405	47	513
627	154	227	309	809	352	173	987	390	615
500	712	135	700	618	908	673	289	65	765
642	26	432	606	963	732	881	925	590	468
977	637	861	858	325	840	296	864	249	139
458	914	487	312	234	67	646	892	646	638
900	939	56	447	164	57	364	616	718	455
565	592	41	599	783	812	313	745	615	182
832	408	431	297	329	558	955	63	918	97
255	160	157	903	7	498	463	497	615	607
861	131	585	614	801	831	222	248	532	710
546	30	260	581	10	574	82	680	387	677
426	39	947	613	481	803	767	804	850	549
786	789	421	394	980	171	177	436	743	951
430	844	356	430	730	617	129	600	411	830
605	691	521	907	904	303	626	210	94	284
701	8	178	291	118	606	66	694	449	188
645	247	569	678	793	700	302	646	959	278
589	82	667	687	912	561	41	80	456	115
231	155	253	839	328	289	281	52	145	412
257	535	961	12	616	164	92	456	891	970
904	557	501	430	615	40	668	535	8	345
945	931	903	931	604	181	8	6	847	938

502	351	600	593	457	669	350	676	971	611
273	63	602	435	640	792	478	927	218	33
191	42	177	495	322	424	708	343	224	712
365	392	405	334	836	155	637	186	658	12
635	375	85	571	926	954	107	8	267	317
350	930	708	665	343	63	183	740	383	807
215	723	991	466	109	980	682	682	736	80
538	388	769	252	822	311	984	205	616	839
977	978	212	777	412	252	744	314	665	286
301	228	456	404	493	130	852	705	216	309
724	413	95	445	546	47	837	274	118	325
486	966	589	476	309	791	892	390	792	349
432	761	998	430	657	164	246	279	856	722
875	841	308	795	546	245	622	859	344	621
902	497	649	997	68	172	508	866	470	212
8	692	633	166	866	411	759	462	235	729
328	43	453	756	925	383	215	272	138	86
418	685	149	953	645	456	363	225	35	565
202	399	21	286	901	794	158	340	942	801
55	217	460	473	106	204	750	881	537	431
718	420	989	971	901	970	622	794	407	590
475	124	878	176	569	498	352	238	988	559
616	733	910	402	428	617	349	7	691	538
56	50	471	853	850	157	440	872	339	379
119	19	771	451	25	318	503	117	587	388
325	580	429	856	614	867	390	875	55	659
390	152	424	878	992	672	653	91	278	32
165	505	400	62	227	125	902	146	779	353
694	428	2	89	260	814	588	114	492	445
458	324	224	67	405	87	357	461	907	795
163	868	77	386	136	65	506	397	503	527
464	839	241	843	708	942	226	300	865	569
863	322	150	840	305	174	871	269	131	102
983	461	78	844	661	158	200	170	631	191
556	876	736	628	283	411	993	168	675	51
87	579	615	297	84	716	477	911	803	440
358	773	111	454	238	474	115	879	446	318
982	101	524	153	881	196	360	209	266	968
191	855	504	412	846	958	571	134	322	262
290	36	571	948	378	310	96	315	242	528
714	245	303	395	605	868	293	441	494	610
795	714	593	542	977	259	638	691	281	945
152	760	535	917	785	399	733	738	337	974
459	8	829	485	692	12	729	74	478	683
194	286	710	950	934	992	975	234	58	677
245	676	18	482	845	362	500	196	984	617
880	103	790	142	597	367	609	561	563	375
50	664	451	202	995	392	499	131	578	370
155	895	852	522	701	55	640	75	700	704
798	1	880	402	867	676	814	21	874	327
506	919	732	547	742	623	499	930	811	933
473	624	966	121	851	352	720	649	449	180
854	585	700	113	725	618	935	276	255	369
666	263	694	401	357	916	28	110	927	621

Four Digits Numbers for Populations of 9999 or Less

9664	2062	47	5435	4636	9275	5739	3297	8807	2304
5547	3866	2214	1682	3978	2740	2161	9076	9201	40
712	5377	4382	5015	6084	5068	3781	3108	4028	6102
3442	3437	2794	1983	3830	2168	2772	289	9254	4740
9409	9350	6424	7421	5488	2297	1973	6159	6368	5204
6310	8194	9270	3540	8628	9401	5222	8648	5417	7843
9732	3479	2331	1482	5803	4284	6743	5535	370	2498
5844	2440	2766	8523	2616	4893	1292	6642	9533	9931
1508	7766	7331	9530	7320	4248	3687	686	3461	8468
4161	5447	5473	4432	5224	8859	760	9066	6747	313
1825	7467	8760	1235	282	3791	4855	9614	7728	7025
2058	9321	7072	8348	4517	9686	5426	4300	5857	8317
7130	7481	2539	7612	3029	4002	8067	2947	9578	4399
5391	8000	8872	2232	2345	180	8207	2091	2466	6638
5245	6224	1041	8818	2396	6505	3718	1021	1498	5967
2529	5959	7397	1608	1675	7750	6519	7703	2900	340
4013	6322	7822	6813	594	9297	2038	2552	7634	3330
3367	2736	6636	7483	4069	2124	6657	9759	4376	2609
788	6985	2189	1496	279	9740	1282	992	2406	1513
7856	6854	5667	8843	2778	1687	3414	6634	4370	5843
4498	382	4071	6397	7034	4519	4822	2165	8877	3602
9526	245	5892	563	4414	7033	6633	3735	9671	4187
9498	1882	7161	7520	5983	3937	2592	4277	1101	7684
6968	1768	9579	9090	9684	7830	3920	1513	3074	1082
7923	1495	5797	6444	6752	5375	9877	8891	2160	8423
3745	5903	8946	5728	1139	6590	6249	1550	3190	2954
4766	1357	8552	6256	8501	8268	3905	8963	7117	3119
4693	236	2504	4869	3415	436	650	5566	346	7610
7407	1598	9001	6427	4245	436	6202	7536	7596	9595
4093	2812	2867	2031	8933	9459	1733	9696	9030	3442
8791	4457	1640	207	1174	3119	6195	8173	2215	748
8680	7951	7763	4028	9528	7765	1234	3863	4861	3045
1000	3956	8415	5659	1201	9555	9020	5745	4584	8123
5944	6632	3453	1117	1972	795	2329	3615	1548	2325
3417	6005	8832	8891	3461	9445	8012	3641	8095	4333
5716	5027	7280	8483	2864	25	2913	9244	813	3702
7210	1268	4130	5617	7957	9156	9837	1015	4212	1691
480	2280	3573	1885	5851	3628	9578	4553	5731	9498
5354	637	3464	4608	7099	4996	7740	1158	8490	1883
7406	6136	4611	9819	1662	9200	1501	5103	5479	9105
4907	652	7588	4145	9341	4409	5878	9578	6035	9023
2556	2498	5881	2038	8895	2132	964	3286	6940	1024
5762	3726	2988	72	6627	7431	5209	7900	5626	5953
5233	2518	2341	1771	1064	746	4723	5064	6148	8374
7595	5496	6953	1522	4889	8265	8893	7166	9224	1108
7952	8309	9904	6495	2841	6755	7947	730	33	3960
4219	9170	1531	7930	4288	4290	2695	1628	1067	807
4990	5871	3868	9581	5981	7169	9937	9518	6434	8491
2074	4189	1860	8416	3434	7381	3340	1646	8099	9308
9991	1336	3509	2688	2896	1231	8363	5420	7861	3054
7062	4064	1827	2140	9305	9855	5294	1757	924	6464
590	4108	9551	6225	3339	3469	6215	9045	1955	4427
1457	5728	7532	5708	2068	4909	3947	7533	2026	340
5534	8007	8742	2729	7174	1472	3202	7866	9137	9323

7476	3329	5614	8249	6555	6008	2089	9539	5912	6203
4062	9288	9645	1392	3754	7004	212	2248	3430	1585
525	1147	318	8146	7285	2434	7380	1517	9149	1149
7281	1880	828	4435	4383	5514	1701	7363	7133	1114
5053	2368	667	9654	1512	9031	6987	3272	7796	8422
7545	6124	9354	3723	590	7701	2996	6347	3109	6560
3109	4275	4712	9945	2550	6830	8308	2266	6810	7600
9906	2900	7544	4741	7396	1297	9059	5366	5645	4837
8857	8250	2757	2430	821	6558	9835	4310	7145	9827
4102	6002	2593	1910	2700	1928	2192	9111	2045	1621
943	217	5045	9012	1645	7659	6054	2764	4434	6514
891	3120	9116	5563	6770	8232	8910	2136	4488	447
1663	9948	2712	499	2169	6655	1704	5108	6647	5345
1346	920	8006	1683	5782	5285	7962	5933	4540	1823
9627	6561	7478	6258	1639	9663	8382	5478	2446	5912
9577	305	828	4255	7385	9929	6251	9080	5775	3482
153	5066	3055	1716	6747	1436	3941	9270	9442	4838
6847	5461	6474	7561	3756	9109	6835	5318	7485	332
5102	6306	8724	9797	1259	758	2660	3388	9095	7724
2557	7767	4289	3278	5110	9787	758	1881	9941	239
1377	120	3062	9882	6653	9537	1665	3249	2455	2767
5063	3180	5391	4708	4143	6553	1919	7936	9173	9189
4802	9094	3291	5398	7981	453	6543	5126	8477	8393
2794	9181	1402	7995	9366	509	1686	482	6744	6973
3598	7717	3195	8625	6671	5478	6645	9922	4116	4741
3648	4866	7315	7666	2808	530	7496	2533	7480	1944
3182	9315	108	8806	9497	5146	8032	1985	2939	6356
8119	5294	2702	1342	5054	5488	7145	5943	5632	972
1502	588	8909	7169	423	5887	9536	4035	6448	927
9141	8675	2998	5961	8081	3541	7984	8724	7428	8171
1622	1089	8516	9944	9552	287	4906	6811	9858	6401
9102	2491	70	5364	3869	2071	7757	4168	5494	3505
5791	2514	3837	7967	893	2610	1507	9532	1531	6350
2016	2148	8788	6578	4252	9373	1276	6665	8112	9853
2699	117	3645	8983	8160	9426	3537	4759	2792	894
6297	3250	3825	9641	4978	6690	4677	6513	3775	4645
7148	6115	2352	6212	5334	2691	5236	8753	2344	8059
1125	6092	8403	3324	4445	6674	6454	3596	9015	9642
8847	2416	1152	4299	6194	126	7063	5932	7006	7888
6864	8462	4188	6576	5084	1882	2002	7263	4975	9971
4573	7518	1493	1225	4544	5226	5280	3506	7979	9167
7499	346	9086	3052	2861	4399	5885	7252	5686	999
5378	9922	1351	2287	4351	6760	2956	9895	9377	6099
566	1634	7120	3561	7857	5169	3545	7994	8522	9141
8103	7901	2280	9717	6515	5093	7819	8019	3228	9773
7537	1415	2136	8771	6403	9140	1678	6164	4804	204
7885	2972	2701	9068	6490	178	9952	2057	2669	6769
5137	4960	4541	2028	2740	9820	3985	8796	6016	6342
5898	1912	396	926	4466	3561	9783	3762	2553	4752
5559	1983	7801	9624	5667	4319	6527	6824	8607	243
4025	9659	4684	4063	7349	4248	4358	1936	4188	2387
1033	7273	8913	3359	3140	7492	4398	6385	7848	2612
5708	2957	6244	3625	9240	5766	7342	6149	8423	8426
5745	2298	4565	7744	5317	1266	8930	7727	8703	6569

1013	4051	1873	5010	4175	7032	5462	9584	9352	3322
5840	7671	9668	9428	5579	6058	2379	3550	463	4649
4159	6230	334	5979	2473	5721	4391	3114	4122	2290
5760	8915	9569	3177	7714	7118	9122	7424	1350	3220
4580	7299	2098	621	7428	530	9883	5001	2187	5065
5297	7397	990	5587	1621	3953	3007	8485	39	7806
9791	9524	2888	6078	5140	5907	7291	2451	5584	1968
9014	3274	5079	5204	3891	2702	4995	6865	1662	9799
8013	8829	4564	8102	2001	5973	527	5608	7485	754
8306	640	9787	4238	9409	6576	4443	5272	9147	5905
1979	7035	6665	1578	5654	7683	1286	1116	3246	9295
27	6462	1496	6857	8606	22	9282	6494	5811	4884
3131	9661	8557	4676	6160	7529	2482	6025	9040	7271
421	4096	9067	9465	8607	9179	951	3355	7945	9783
403	4152	5182	5219	9121	4132	6356	8130	7265	6722
2325	4939	7014	306	3749	9695	8304	5965	356	4264
5337	873	6842	5357	9952	6566	5242	6344	5461	8804
1120	9341	2030	3237	8424	517	2213	8608	5343	9119
2726	6702	1016	8150	6047	5760	433	2193	2954	1579
2376	5350	4580	8015	2737	9741	82	6115	3061	2561
3519	8585	1662	7146	1036	3818	2145	1022	6944	1206
1688	1403	4785	6945	8922	6111	6987	7062	8755	5388
4193	1875	8981	7557	2865	3603	1023	9018	7249	6358
4651	6533	9303	5222	4011	7276	7675	8635	9829	9618
4328	5816	107	5110	4906	8430	9178	9637	6434	3219
2454	9214	3444	9826	1702	3380	1125	5513	3214	6680
1588	6010	8693	6185	6836	9206	6205	524	9543	5893
6056	3408	223	9298	3909	2090	6896	2606	1012	8762
832	1208	8862	325	9476	3873	3165	9530	5142	4587
9416	7934	5579	4254	9960	8658	9984	8998	9872	4405
1579	9269	6498	3714	5331	1479	4997	5912	6906	1393
9743	2736	6469	5973	8907	2095	8400	7926	7090	6940
5540	4637	8328	9708	4045	742	9321	313	2456	1028
237	3150	6069	7906	7922	6078	5197	5157	3869	1863
3431	7175	6786	31	9477	429	7108	4615	3674	1363
8290	760	7785	2446	7244	649	4151	5594	3737	6732
7806	9693	6115	7710	2639	6418	8187	258	212	6096
9614	6948	7310	2808	9651	8335	5831	5457	1579	4695
6096	9032	2672	358	2189	7762	2052	1121	5410	9401
6264	2711	9431	7360	9918	5755	8261	4886	6247	233
5607	3031	9917	9890	1725	1616	1940	4557	1350	9910
4028	5865	3809	1250	7236	9322	3908	3303	7233	3208
9675	3221	6051	2269	572	4366	7652	1673	7250	8861
2151	4200	1461	7664	1057	1135	2202	7392	3348	4822
1696	608	9757	8371	2301	3800	77	5459	2939	4759
5861	713	1144	8581	8341	8641	4313	9015	8913	6572
1265	9362	7039	4575	2693	4668	7904	2843	6611	4397
9666	4478	2377	2338	7661	9181	4402	7937	383	793
4126	783	9606	9156	6359	7477	4470	4283	3584	7579
6894	8277	9309	2878	3147	7992	9069	1682	3925	8894
5166	7362	2777	8087	8743	7860	229	1980	288	383
8437	1569	7155	3002	8730	5779	4205	2373	1869	868
1156	4301	8381	1333	7728	1364	3803	5305	5196	9316
1178	4889	424	1485	658	9433	5988	7898	3543	7172

1613	3405	4087	1624	5442	7010	2948	9353	8103	1034
7714	6624	5845	2428	3308	8249	9339	2738	1417	1459
8253	110	7105	6072	4256	6487	5976	2272	1041	1709
4214	6455	7463	3730	1338	3132	7389	1685	3042	8333
7348	6014	8934	7503	576	7361	7537	8343	3557	3481
8387	6576	8642	855	8576	99	3851	5243	8581	4490
8439	2893	9724	348	337	1621	3109	421	9043	8487
7373	1999	5072	8273	102	7544	4548	4499	5254	4018
5043	2184	6426	8876	6238	9071	3322	8211	6525	9542
6254	9990	4123	2934	1021	2877	8809	5482	4018	8601
7863	2595	4914	3332	7309	5706	1734	1039	7059	5389
705	9311	6042	9982	697	5581	920	6420	9614	9251
9483	7512	7559	2670	7308	7364	9148	1437	3795	4181
4778	2003	1152	7156	8234	2032	7438	1675	5440	6498
2247	4547	6730	9979	1143	8480	2459	3130	2416	2536
9314	8780	7275	2751	2154	651	2057	4683	3743	5144
8556	7060	2194	4175	6059	3289	3492	4520	6179	5013
3924	6647	9096	9456	4765	3496	7278	9754	9065	7180
293	5019	7881	9075	1794	4326	789	6269	7274	6358
3037	4831	8697	3926	9164	7885	9573	78	443	3935
1597	21	983	8435	1431	569	4837	9054	3723	6344
3961	2608	3965	9440	4366	9135	2277	6771	5308	6081
6709	6827	3855	3051	2164	5057	4682	5117	8530	4578
2437	132	9103	6466	1509	3028	7925	1308	5568	7566
2099	1264	6686	3509	2689	9338	1415	4677	5305	89
8650	862	8953	3497	1616	4075	9251	1198	3835	7079
9607	1812	6414	9689	1447	9588	1488	5809	2091	8064
4174	1662	6368	7993	2873	3198	5564	6219	5267	8135
4803	9753	4847	5606	7443	6741	331	3893	2592	3564
7802	4192	9328	4773	2910	5899	8728	93	7997	6382
2288	196	6464	5692	2838	480	4251	4209	1534	9562
5754	8664	2038	6705	9024	9526	459	9904	2608	214
7166	3838	3858	6099	4058	4421	6057	8777	8384	4156
9209	8569	1717	30	6840	5723	160	3142	8640	8291
9388	6809	6303	2136	5624	7354	7401	6053	1126	9298
9647	2465	298	4173	5371	1662	7	9684	3575	5055
5200	3423	4391	411	8425	2865	8301	9543	9329	867
9956	6417	7758	3376	3933	1143	1515	3579	7291	2837
7409	4203	1240	1793	1652	7189	1803	8960	3228	7463
6784	8182	1304	5006	3903	4167	5300	6966	2437	6657
3684	9010	8205	8774	5117	2645	9261	4996	3012	2727
7101	1748	2121	6869	5776	1062	3241	5976	8709	5292
9618	2623	594	8330	6167	1486	9199	6316	75	3565
9431	8290	8908	3393	9492	4772	9787	5967	6491	9723
757	7615	6332	8872	2917	2516	235	4856	9417	4093
7738	7175	4919	8000	3509	2386	6604	915	2827	7554
5329	6868	8061	7384	3025	312	6012	3036	9928	2663
3428	8073	2738	6527	5578	4516	2295	9329	193	9479
6880	5566	6633	345	4716	4398	7628	3958	6774	6811
8427	2798	8480	4044	5701	8602	6406	6525	6054	1413
3549	20	1465	9511	4285	3217	6528	3205	7598	8466
9818	2950	4671	4890	9231	9757	4436	592	8643	3372
8180	8163	734	1182	1794	5235	8315	8324	1765	9265
4002	6966	8499	3298	5592	224	8074	6908	1964	3684

1920	2570	6165	6077	1886	6653	7815	5691	9968	905
6542	6295	9856	7679	5833	1810	1823	6695	960	7674
177	5129	8713	7134	8989	846	1271	1867	2186	8021
4039	4886	1601	1834	4810	1220	4079	6490	9085	9320
6222	8262	3905	3670	2886	2781	20	6564	3004	3297
9767	4525	3834	4121	5475	2331	2238	976	751	5115
9068	7467	4496	6512	268	4392	4988	8319	5767	6123
8869	4638	4785	5750	7403	969	3616	8241	9817	6223
9497	8302	1099	3125	1664	7188	9074	9975	8167	155
3118	4231	4558	3795	4337	5891	8035	9956	4579	6138
8142	476	9089	4216	2611	4448	5189	3009	4445	7226
6795	1288	3841	7906	2130	8097	6030	9489	9481	2248
3650	3446	3322	7393	9726	7908	681	635	4863	6204
5056	160	9738	9945	2761	4846	1494	8401	4010	6329
120	3373	8619	1480	8416	6273	3633	781	6637	1653
7758	5550	405	8879	4908	4496	7992	1178	6737	7573
555	8785	1487	2584	6431	391	3995	7536	8074	4626
9207	9183	7728	787	9047	5738	5449	5535	9970	9238
535	9778	6062	499	4993	7454	12	7157	5114	5443
1813	2753	4758	1316	2533	2331	1445	3148	7995	7516
3833	3107	4714	1545	6703	4042	7932	2220	7008	5794
9100	8247	2117	5429	7645	1933	8819	3140	9366	8707
9197	3012	1307	1444	6964	5383	448	5040	5342	5015
1059	4232	5100	6795	3059	5110	8820	8181	1220	8303
5007	5119	2575	9307	3120	5642	6851	8909	8131	2874
2295	4201	690	6661	6711	8131	6507	539	1080	3067
6034	8262	579	1349	3044	1614	5364	3288	8199	8716
951	583	1201	9550	5538	633	2626	2920	9118	4701
4023	6562	6717	409	2383	9638	5614	6518	2565	4309
3872	5488	8772	626	5038	6753	3680	6453	1344	1210
1303	1626	5257	4872	7191	3094	6730	7160	7058	5235
977	6805	2430	7079	9145	5821	9413	5656	1694	9531
4161	2183	1859	8098	6152	5315	4017	2547	7866	3171
9309	5727	6941	3360	8368	6205	4421	7727	8483	544
185	6029	56	6932	4133	268	4685	646	9259	8899
4727	9310	160	7624	1672	3411	8116	1004	8187	5052
1305	6597	6162	5405	6263	837	602	8834	4180	3395
6723	9156	3118	4212	5072	1013	4756	4942	7037	6811
1744	4018	580	7217	9273	2060	3533	658	1947	1838
9316	4809	4540	4526	7399	532	2764	1442	8376	6228
7598	8011	972	8089	4315	4162	5840	9199	4765	2881
8495	7963	9033	6136	1215	3832	53	4889	1260	5791
2272	7429	262	6579	2963	7725	7112	3113	2283	3031
4198	1076	5652	7457	4342	9152	9574	5727	3266	5859
9472	8836	9947	9467	5639	840	4687	8954	897	3478
2263	1479	1063	2859	4981	9339	6807	9928	7984	6873
3002	3928	6670	5287	9159	5586	3542	875	2039	4222
9352	9581	9033	524	872	8406	8415	4191	5145	1599
46	3164	7548	7111	7635	8679	8519	6286	1147	7836
1294	7254	5447	2926	489	9988	8783	4217	8874	8505
2196	434	7191	3170	8446	8634	9347	3584	6559	2714
2833	4	5585	7250	1712	8793	8648	908	7018	4836
5905	1123	6914	1420	2488	9286	6443	5524	5031	3139
4231	4009	7877	615	972	3652	7553	6821	2040	5520

APPENDIX B

SAMPLE SIZES

Sample Sizes

The Sample Size Chart can be used to determine a sample size. Find the size of the population in the column labeled, Population Size and read the sample size in the next Sample Size column to the right. These sample sizes will provide data with + or - 5% accuracy in 95 samples out of 100. (I.E., if one found that 50% of a sample responded yes to an item, it is very likely that 45% to 55% of the population feels the same way.)

Selecting the Sample Size Select the sample size to give the level of accuracy needed for your study. For example, if you are surveying a population of 1000 students and want to have + or - 5% accuracy, select a sample size of 278. If, however, you want + or - 5% accuracy for the statistics for the responses from males and females, you would have to base the sample sizes on the number of males and females. For the purposes of this illustration, let us assume that there are 500 males and 500 females in the population. To obtain + or - 5% accuracy for each of these groups, the sample sizes would be 217 males and 217 females. The total sample size of 434 would give statistics with more than + or - 5% accuracy for the total group. However, the study would also be more expensive since more people were involved in the survey.

You will need to decide the level (male/female, total group, etc.) at which the most critical decisions are made and select the sample sizes at that level.

Sample Size Chart

Population Size#	Sample Size	Accuracy*	Population Size#	Sample Size	Accuracy*
25	24	± 5%	1000	278	± 5%
50	44	± 5%	1500	306	± 5%
75	63	± 5%	2000	322	± 5%
100	80	± 5%	5000	357	± 5%
150	108	± 5%	10,000	370	± 5%
200	133	± 5%	50,000	381	± 5%
250	152	± 5%	100,000	384	± 5%
300	169	± 5%	Very	250	± 7%
400	196	± 5%	Large	1000	± 4%
500	217	± 5%	Populations	1500	± 3%
600	234	± 5%			
700	245	± 5%			
800	260	± 5%			
900	269	± 5%			

For populations between the sizes listed, interpolate from the sample sizes given.

* For values near 50% (this is region of largest error).

HIGH-TECHNOLOGY TRAINING MODEL MODULE

Working with Small Groups

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
James P. Breen
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 282
Purpose 283
Objectives. 283
Facilitator's Role In Small Group Discussion. 283
Phases of Group Interaction 284
Learning How Groups Work Through Experiential Learning. . . .285
Types of Small Group Methods of Instruction 286
References. 291

Working with Small Groups

Introduction

Many individuals fail to participate in large group discussion because they are intimidated by the group's sheer size and diverse background, or because the high number of group members does not provide opportunity for everyone to speak. Small group interaction often reduces shy individuals' inhibitions and allows participation by all group members. It is advised that small group sizes be kept below eight people.

Small group structure can be rigid or flexible, introduce new members or strengthen existing bonds, facilitate new and creative ideas or dissect a problem and determine a solution. However used, small groups can be an effective tool for trainees or teachers.

Selection

Before we begin with the role of group facilitators and workings of small groups, it may be beneficial to briefly explain how to choose the members of small groups. Perhaps the most critical aspect in selecting group members is to clearly define the purpose of the groups and the outcome desired.

If the purpose of the group is to predict the future skill needs for entry level work force members in five years, it would be advisable to use employers as group members.

If the group's purpose is to decide if punishment of school violations is being distributed evenly for athletes and non-athletes, a group comprising student athletes, student non-athletes, and administration officials would be advisable.

If an instructor simply wants to increase class discussions through small group interaction, a random grouping may be best. It should be noted that if small group discussion is used often in a classroom, it is advisable to rotate group members regularly to maximize student to student interaction.

For more information on how to choose group members see modules on Delphi Survey and Sampling.

Purpose

The purpose of this module is to explain the role of the facilitator in small group discussion and to provide examples of various small group methods.

Objectives

The objectives of this module are to:

1. Describe the role of the facilitator in small groups.
2. Provide exercises to explore how groups operate.
3. Provide examples of various group methodologies.

Facilitator's Role In Small Group Discussion

During group work or discussion instructors perform the role of facilitator. While the role of the facilitator varies depending on the group activity, it remains the vital key to the group's effectiveness. The facilitator plans, organizes, and directs the group's activities. Though the students provide information and discussion, it is the facilitator who maintains a comfortable atmosphere conducive to open yet controlled discussion. The facilitator will:

1. Introduce the objectives of the group and explain the parameters for discussions/activities.

2. Guide/lead the group discussion/activity.

   a. Keep on target

   b. Involve all people

   c. Quiet people who want to dominate

3. Summarize the group's findings.

It is important for a facilitator to understand how groups work, know what activities work best for various group objectives, and to be well organized yet sensitive and flexible enough to adapt to changes in the group or objectives.

Phases of Group Interaction

Any group, regardless of size, goes through three distinct phases as it moves toward accomplishing its goal. Although these phases may be mismanaged by unskilled group leadership, they are clear and distinct. The three phases are Clarification, Evaluation, and Decision.

Clarification

In this phase facts and opinions concerning the situation are presented and leadership roles begin to emerge within the group. This phase should represent a minimum of 50% of the group time. Two things must be accomplished in this phase.

1. Group objectives must be clearly stated.

2. Roles to be assumed by each group member must be tried out, accepted by others, and then stabilized.

Evaluation

During the evaluation phase group members work on the goals/objectives discussed in the clarification phase.

Decision

During the decision phase the group selects the best solution or final decision based on the group's activities.

Learning How Groups Work Through Experiential Learning

Experiencing the processes and sometimes frustrations of how groups operate can often be the first step in successful group work. Cog's Ladder (see University Associates 1974 Annual for Facilitators, Trainers, and Consultants) is an excellent exercise that explores the factors which distinguish process from content in group interaction. Each group will go through distinct steps or phases in the process of interaction. How well the facilitator understands and directs these phases often will dictate the quality of content the group develops.

Group consensus seeking exercises are also excellent beginnings for group problem solving activities. Examples of group consensus seeking exercises are contained in modules #307- Group Problem Solving: An Experiential Learning Exercise, and #308 - Group Problem Solving: Lost at Sea, A Group Consensus Exercise (these modules were adapted with permission from University Associates Annuals for Facilitators, Trainers, and Consultants).

Fish bowl type exercises provide participants an opportunity to observe and experience the group process. In this exercise one half the members are seated in a circle and given a topic to discuss. The other half are positioned in a circle surrounding the first and observe. The roles are then switched so each group discusses and observes. After this process the facilitator directs a group discussion on what was experienced and observed.

Types of Small Group Methods of Instruction

Which ever the small group methods chosen it is important to provide a means of recording the ideas or findings of the group. Sheets of paper, chalk boards, white boards are all acceptable; however perhaps the most common and flexible is a flip chart. Flip charts are cheap, easy to transport, can be preprinted with questions or guidelines and are easy to use.

Buzz Groups

Procedure.

Large group is broken down into smaller groups of five to ten people. Each group openly discusses their assigned topic then reports to the large group. A group leader is chosen to direct group discussion and to report the findings.

Advantages.

1. Involves everyone.
2. Reduces intimidation of speaking to large group.
3. Small number facilitates communication between members.

Brainstorming

Procedure.

Group members are given a topic and are asked to vocalize any or all ideas about that topic. It is important to remember three things.

1. No judgments, or "all comments are good comments."
2. Quantity of ideas/comments are desired.
3. Creativity is desired.

Advantages.

1. Because all comments are good, intimidation is low.
2. Produces a large quantity of information.
3. Facilitates creativity.

Nominal Group Technique (NGT)

Procedure.

Large groups are divided into groups of 5-8 people and given a topic or problem. Individuals are given time to think to themselves about the topic. A group leader then directs:

1. In a round robin fashion, the listing of all ideas from each person. This is done without discussion.
2. Discussion within each group to clarify or expand all items on the flip chart.
3. Each individual to vote for the top five or ten items.
4. The group to make a priority list from those items (priority list length will vary by topic).
5. Each group to report it's findings to large group.

Advantages.

1. Good tool for problem solving.
2. Provides both qualitative and quantitative information.

Phillips 66

Procedure.

Uses the same procedures as Buzz groups except each group has six members and discusses each topic for only six minutes.

Advantages.

1. Involves everyone.
2. Facilitates communication.
3. Enforced time constraints keep members on the topic.

Experiential Learning

There are numerous experiential learning exercises covering a wide range of topics. Exercise lengths may vary from five minutes to two hours and are an effective way to involve group members. For a more complete explanation and list of exercises see University Associates' *Annuals for Facilitators, Trainees, and Consultants*

Advantages.

1. Fun change of pace.
2. Involves all group members.
3. Applies what is learned.

Case Studies

Procedure.

Group members are given an actual incident that did or could happen in the related field. The small groups discuss possible problems, solutions and ramifications of the incident.

Advantages.

1. Used "real life" situations.
2. Members can call on past or present experiences to discuss the incident.
3. Incident example may be structured or modified to fit group and objectives of the training or educational activity.

Focus Groups

Focus groups are a popular means of acquiring a qualitative set of responses from a group of people familiar with the topic being discussed. The group consists of eight to twelve people working with a moderator to express opinions and attitudes and to discuss the specific topic that all group participants are familiar with. Sessions usually run from one to two hours.

Procedures.

1. Initial client meeting
2. Development of the interview guide
3. Second client meeting
4. Conduct of the groups
5. Transcription of the proceedings
6. Internalization
7. Organization and writing
8. Presentation of the findings

Advantages

1. Provide easy, fairly reliable access to the ideas and attitudes of a work group.

2. Provides good data to be put into questionnaires for a quantitative study.

For a more in-depth look at focus groups, see Zemke.

References

American Association For Vocational Instructional Materials (1977). Conduct group discussions, panel discussions and symposiums: Module C-2. Columbus, OH: Ohio State University.

Applebaum, R.L., Bodaken, E.M., Sereno, K.K., and Anatol, K.W. (1979). The process of group communication. Chicago: Science Research Associates.

Donaldson, L., Sannell, E.E. (1986). Human resource development: The new trainer's guide (2nd ed.).

Johnson, J.W., Johnson, R.T. (1985). Cooperation in the classroom. Edina, MN: Interaction Book Company.

Laird, D. (1985). Approaches to training and development. Reading, MA: Addison-Wesley.

University Associates (1970-1980). Annual for facilitators, trainers, and consultants. San Diego, CA.

Zemke, R., Kramling, T. (1986). Figuring things out. Reading, MA: Addison-Wesley.

High-Technology Training
Model Module

NECESSARY SKILLS MATRIX

Developed as Part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies Under Grant No. V199A90151.

Prepared by:
James P. Breen and J. Timothy Mero
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction 294

Purpose. 295

Methodology. 295

Findings of the Study. 300

Significance of the Necessary Skills Matrix. 301

Appendix

A. Necessary Skills Matrix. 303

Introduction

The age-old questions previously asked by educators in the past, who were concerned with education for work, remain today. First, what do students need to know to be successful. Second, what skills or competencies do students, as learners need to acquire to be competitive in the workplace. Although the questions remain the same, the answers may vary from generation to generation, from year to year and from geographic location to geographic location in response to a variety of convoluting factors.

To keep curriculum current with locally determined needs, schools must develop a network of workplace needs. One can draw upon reviews of relative research, state and federal guidelines, follow-up studies of local/regional graduates, surveys of business and industry, and interviews of local business and industry representatives, as excellent sources. This is especially true when information from the various sources are combined and compared to attain up-dated information upon which to base decisions.

One of the goals of the High-Technology Training Model Project was the development of a Necessary Skills Matrix. The intent was to identify those skills necessary to acquire employment and be a competent contributor within the workplace. Data was collected from; (a) the Wisconsin Department of Public Instruction's Education for Employment Program, (b) five year follow-up studies of high school graduates conducted as part of the High-Technology Training Model Project, (c) interviews of local business and industry representatives, and (d) business and industry surveys.

Purpose

The purpose of this module is to provide an example of how to conduct a necessary skills study and to report the findings of the High Technology Training Model Projects' Skills/Competencies study.

Objectives

The objectives of this module are to:

1. Provide an example of how to conduct a necessary skills study.
2. Show the results of the High technology's study on necessary skills/competencies.

Methodology

Data was gathered through project generated industry interviews and surveys, and high school five year follow-up studies. This data was pooled with skills/competencies lists published by Wisconsin's Department of Public Instruction (DPI).

A base list of skills for the matrix was formed by combining lists of DPI's employability and basic skills contained in the Wisconsin DPI publication, *Education for Employment.* Where duplication of skills was found, only one entry was made. Skills from the other studies were then either categorized within the base list, or added to the list.

It must be noted that these various lists may not be directly comparable on a one-to-one basis. It is the composite of these lists that is important. One must also accept the fact that the various studies were designed to identify local requirements in response to different needs.

Information Sources

The following is a summary of each of the studies used in the development of the Necessary Skills Matrix.

DPI Basic Skills.

This basic skills list was taken from Education For Employment, published by the Wisconsin Department of Public Instruction (DPI)in 1988. The Department of Public Instruction's stated purpose for their basic skills list was to identify those skills that all K-12 students must have to; (a) advance to postsecondary education, (b) promote a successful transition from high school to the world of work, and (c) master the lifelong skill of learning how to learn.

The implication of this basic skills list can be far reaching if properly used. The Department of Public Instructions goal is to establish staff development activities that are designed to assist K-12 teachers and business/community representatives integrate; (a) basic skills into the vocational curriculum, (b) world of work examples and competencies into the general education curriculum, and (c) activities across grade levels and disciplines with special regard for student populations with unique learning needs.

In conclusion, DPI's basic skills list was designed to serve as a base or minimum standard by which K-12 teachers can integrate relevant skills/competencies into all their curriculum. The skills listed are those considered necessary for the successful transition into postsecondary education or the world of work, and to develop lifelong learning skills.

DPI Employability Skills.

Initiated in response to a growing concern over the number of youth who fail to make a successful transition from school to the work world, Wisconsin's Department of Public Instruction joined forces with Parker Pen Foundation of Janesville, WI. The Parker Project's first phase provided the necessary information base required to assess the school's capacity to meet the needs of business, students, and society. This information base was also used to project future business needs. The Wisconsin's Education for Employment concept grew out of the Parker Project's work.

Teaching the skills necessary for students to seek, attain and maintain jobs is a primary objective of Wisconsin's Education for Employment. By incorporating employability skills and standards, such as punctuality, responsibility and general work ethics, into the schools' curriculums, students will be better prepared to make a successful transition into the work place.

Too many high school students do not understand the importance placed on punctuality, taking responsibility for oneself and actions, and working together; and therefore, are ill prepared for the work place and its demands. By incorporating these skills/attitudes into the schools, the students will be better able to perform on the job.

B & I Surveys.

The statewide business and industry survey was conducted by project staff and based on a random sample of 285 companies drawn from a random list of 12,000 businesses and industries generated by the Wisconsin Department of Industry, Labor, and Human Relations (DILHR). It should be noted that the DILHR sample did not include representatives of the hotel and tourism industries. The purpose of the survey was to identify; (a) who within companies is responsible for training, (b) the type of training currently being done, and (c) that which is planned for the near future.

Although, all the collected data was not directly applicable to the Necessary Skills Matrix, the comments of the 67 respondents surveyed indicated that companies were highly involved in training in such areas as interpersonal relations, problem solving/reasoning, job seeking and getting, work ethics, computer skills, and a wider, stronger base of specific technical knowledge.

It seems imperative that industry be surveyed on a regular basis and that feedback be incorporated into the institution's or district's curriculum development/evaluation process.

B & I Interviews.

During the summer and fall of 1989, participating teachers were asked to become more familiar with the technological changes taking place in the businesses and industries of their local communities. Participating teachers conducted interviews of 103 local companies using a project staff prepared set of questions. Open-ended questions were used to identify any new technologies that companies had implemented in the last two years and the resulting new skills and competencies needed to operate or use those technologies. Also asked was what new technologies companies seriously considered implementing within the next 3-5 years.

A second part of the interview of local businesses and industries conducted by participating teachers identified new skills and competencies current employees and future entry level employees need.

Of particular interest was the strong emphasis industry placed on the basic skills: reading, writing, speaking and listening, and both basic and advanced math. The results also showed a heavy need for interpersonal relations and problem solving skills. It should be noted that representatives of local businesses and industries indicated that computer skills are every bit as important as the traditional basic skills.

The participating educators' interviews of individuals representing local industries spawned two excellent outcomes. First, a list of skills/competencies industry perceives students need to learn. Second, the interviews provided an educational experience for the teachers which in turn provided them with new content and applications for their courses.

Five Year Follow-up

Five year follow-up studies of graduates were conducted by each of the secondary and postsecondary schools participating in the High-Technology Training Model Project. The goal was to obtain feedback regarding employment status and high school preparation. The surveys also requested input regarding the skills or knowledge students had to acquire since graduation, as well as those they anticipate they will have to acquire in the near future to keep up with changes on the job.

General job, general preparation, English and math skills were rated as being of greatest value in high school preparation. Responses to open-ended questions asking what present and future skills will be needed in the work place indicated a significant need for computer, interpersonal relations, supervisory, and technical literacy skills.

Separate modules have been developed and are included in this handbook covering each of the research activities conducted as part of the High-Technology Training Model Project.

Findings of the Study

This study brought a split image of the needed skills into focus. The Wisconsin department of Public Instruction's basic and employability skills address the skills considered necessary to make the successful transition to postsecondary education, achieve employment, and be prepared for lifelong learning.

Business and industry surveys and interviews along with the five year follow-up studies of high school graduates identified those skills the respondents considered necessary to become and remain competitive in the workplace.

Appendix A shows a consolidated matrix listing only items which were mentioned in at least two of the studies. Interpersonal relations and problem solving were the only items mentioned in all studies. Computer skills and work ethics were noted in four of the five studies; and communication, advanced math, and electronics were identified in three of the five.

It should be noted that varying applications of technology backgrounds were consistently identified by business and industry as skills needed by its work force.

Significance of the Necessary Skills Matrix

This study has shown there is a significant need for teaching our students the following skills/competencies:

1. oral and written communication,
2. basic and advanced math,
3. interpersonal relations,
4. problem solving,
5. work ethics,
6. basic through advanced computer,
7. electronics and,
8. strong technical literacy base.

Another significant finding in this study was the thoroughness of the business and industry interviews. Educators talking directly with business and industry experts provide an opportunity for clear, probing questions about skills needs to be answered by those who do the hiring and see the needs on a daily basis. Surveys and follow-ups are fine sources of information, but nothing beats a one-on-one discussion to solve a problem.

APPENDIX A

Necessary Skills Matrix

Necessary Skills Matrix

Skill/Competency	B & I Interview	B & I Survey	5 year Follow-Up	DPI Basic	DPI Employability
Communication	X		X		X
Reading	X			X	
Writing	X			X	
Speaking/Listening	X		X		
Basic Math	X			X	
Advanced Math	X		X	X	
Advanced Science			X	X	
Interpersonal Relations	X	X	X	X	X
Problem Solving	X	X	X	X	X
Self Confidence/ Self Motivation	X				X
Job Seeking		X			X
Good Work Ethics	X	X		X	X
Personal Economics			X	X	
Basic Computer	X	X	X		
User Computer	X	X	X	X	
Advanced Computer	X		X		
Electronics	X	X	X		
Technical Literacy	X	X			
Technical Systems		X	X		
Tech. Manufacturing Processes	X	X			
Tech. Mechanical Background	X	X			
Technical Applications	X	X			

HIGH-TECHNOLOGY TRAINING
MODEL MODULE

Articulation: Helping Students Transition from Secondary to Postsecondary Institutions

Developed as part of the High-Technology
Training Model for Rural Based Business and
Industry, Technical College and Local and State
Educational Agencies under Grant No. V199A90151.

Prepared by:
J. Timothy Mero
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI

TABLE OF CONTENTS

Introduction. 307
Purpose 308
Objective 308
Stipulating the Meaning of Terms. 309
Articulation Programs 313
Overcoming Obstacles. 327
Implementing Inter-Institutional Articulation 327
Summary 331
References 333

Articulation: Helping Students Transition from Secondary to Postsecondary Institutions

Introduction

Within the United States, academic education, general education, and vocational education are generally considered to be based on separate and distinct bodies of knowledge and skills. Feldman (1984), suggests that the educational system in the United States has traditionally fostered this competitive relationship and the perceived need to make these educational distinctions has precluded the integration of thoughts and practice concerning education.

Recent discussions addressing ways to improve the quality of education suggest the integration of academic and general aspects of education with the vocational aspects. Plihal, Johnson, Bentley, Morgaine, and Liang (in press), suggest that any attempt to integrate the vocational, academic, and general aspects of the educational system in the United States will require changes in the philosophy and organization of schools as well as the instructional methods employed. Integrations of the various aspects of the educational system will not, in and of it self, provide the necessary motivation for those students who lack a clear vision of an attainable future.

The educational system within the United States was not designed as a total system which allows students to complete their formal education at a single institution. Students move from exploratory programs at the middle school/junior high school, through the secondary/high schools, and then on to technical colleges, junior colleges, and/or four year colleges and universities. The entire process of transitioning students from one level of education to another, or between one institution and another, is what Selman and Wilmoth (1989) define as Articulation.

The question addressed in this module is, how does education, as a system, transition students from secondary to postsecondary institutions? It should be noted that the discussion in this paper is focused on the articulation programs designed to help students make the smooth transition from secondary to postsecondary institutions.

Purpose

The purpose of this module is to define selected forms of articulation which can be used to facilitate student transition from secondary to postsecondary educational institutions.

Objectives

The objectives of this module are to:

1. Provide a general description of several articulation terms and forms of articulation which include: (a) barrier removal programs, (b) enrichment programs, (c) shared facilities, (d) combined enrollment, (e) contracted services, (f) transfer of credits, (g) time-shortened programs, (h) advance placement, (i) one-plus-one, (j) advanced skills programs, (k) core curriculum or pre-technology, and (l) vocational technical two-plus-two preparation.

2. To provide general information and examples pertaining to the development and administration of selected forms of articulation which help students' transition from secondary to postsecondary educational institutions.

Stipulating the Meaning of Terms

This module on the articulation programs began with efforts to make sense of language and concepts central to the topic. The terms used to define the various articulation programs are used with a variety of meanings by different people. Additionally, when trying to review literature to make sense of these articulation programs, one encounters related terms such as curriculum integration, academic education, general education, liberal education, and vocational education. To add to the confusion, some terms take on different meaning at the secondary and postsecondary education levels.

Articulation

When applied to programs between secondary and postsecondary institutions, Long, Warmbrod, Faddis, and Lerner (1986) describe this application of the term articulation as "a planned process linking two or more educational systems within a community to help students make a smooth transition from one level of institution to another without experiencing delays or loss of credit" (p.1).

In vocational education, articulation has been defined in a number of ways but the central theme is: "to eliminate as much as possible, unnecessary duplication of training across the levels" (long et al., 1986, p.2).

Curriculum Integration

Curriculum integration as defined by Plihal et al. (in press), refers to the process of combining the various parts of a student's educational experience to form a single, more encompassing, experience.

As seen by Plinal et al. (in press), horizontal curriculum integration occurs when the curriculum enables a student to learn various principles (in one course) and develop a full understanding of those same principles by applying them in another course at the same grade level. Vertical curriculum integration, on the other, purposefully connects parts of a student's educational experience from one level to another.

Academic Education

Academic education at the secondary school level refers to education organized around generally accepted disciplines and is usually limited to the knowledge areas of English, foreign languages, history, economics, mathematics, and the sciences (Good, 1973). At the secondary level, all students are required to take a minimum number of courses in a prescribed academic area as a prerequisite for graduation. Students planning to attend college are usually in a college preparatory program (track) and take more than the minimum number of academic courses required to meet college entrance requirements and expectations (Plihal et.al., in press).

General Education

Shapiro (1986), describes general education as unfocused and the dominant track in most high school curriculums. According to McConnell (1952), general education grew out of concerns that at the college and university level, educations were becoming overly specialized while liberal education has become technical, narrow and irrelevant to human concerns. As an out growth of that concern, general education at the secondary level, was designed to develop the common core of knowledge, skills and values considered necessary for students to deal with the personal and social problems expected to confront them in a democratic society (Purves, 1988; Faust, 1950). To some the concept of general education includes both academic and vocational courses (Plihal et al., in press). Parnell (1985), referring to the general education as the academic and vocational desert in the American education system, described it as being made up of a combination of general, remedial and personal/hobby courses. As Plihal et al., (in press) noted, "It is unfortunate that the term 'general' often is used at the secondary level to refer to a track that is neither academic (college-preparatory) nor vocational--a curriculum that reportedly prepares students least well for life after high school" (p.7).

Liberal Education

Although sometime used synonymously with general education, liberal education has a different meaning. Frequently is liberal education used to describe college level education which prepares students for living rather than preparing them to earn a living. Liberal education is education with intrinsic rather than extrinsic worth; education intended to be appreciated rather than applied. The seven liberal arts traditionally comprising a liberal education are: grammar, rhetoric, logic or dialectic, arithmetic, geometry, astronomy, and music (Plihal et al., in press).

As Plihal et al. (in press) noted, the distinction for categorizing selected subjects--mathematics and the sciences--as part of an academic or liberal curriculum, is dependent upon their intended use and the intrinsic or extrinsic value which is attached to them.

Vocational Education

Vocational education is most commonly used in the broad sense to refer to education which prepares people for gainful occupations (Prosser & Quigley, 1949). Variations of this definition refer to education that prepares people for work (Roberts, 1965) or work and family role (Copa, Plihal, Scholl, Ernst, Rehm, & Copa, 1985). In a more focused perspective, vocational education can be defined as a specific set of skills, attitudes and understandings a particular group of students are to develop. The National Commission on Secondary Vocational Education (1984), sets the following as the five areas vocational education should develop in students: (1) personal technical literacy, (2) communication and computational skills and technical literacy, (3) employability skills, (4) broad and specific occupational skills and knowledge, and (5) foundations for career planning and lifelong learning" (p.3).

Vocational education is usually offered through the following subject areas or subfields: (a) agriculture, (b) business, (c) consumer home economics, (d) industrial arts, (e) marketing, (f) occupational health, (g) occupational home economics, (h) technology, and (i) trades and industry (T & I) (Plihal et al., in press). Copa and Bentley (in press), identify career education as a general subfield of vocational education, (cited in Plihal et al., in press).

All too often at the secondary level, vocational education programs are not viewed as the link to the next educational level. If vocational education is reduced to "a euphemism for the handling of students with behavioral problems" (shapiro, 1986, p.91), one can not help but wonder if many of these difficult students behave the way they do because they see no future in their educational--academic and vocational--programs. Unable to visualize the relationship between their high school experiences and the knowledge, skills, and attitudes needed to take on the challenges which lie ahead.

Articulation Programs

Articulation programs are known by various names. Warmbrod and Long (1986) suggest that the articulation programs between secondary and postsecondary two year institutions, make high school students, embarked on attainable vocational technical career programs which span grades 11 through 14, feel like they are college-bound as they catch views of new opportunities and a better, possible future. However, not all articulation programs, are the same. The term articulation has been loosely applied to a broad range of programs. To add even more confusion, selected terms used to identify specific articulation programs have also been used as collective titles for groups of programs. The confusion arises when the titles used to group articulation programs do not adequately describe all programs within the group. Each articulation program is unique and meets a specific educational need. Educators at all levels and in all disciplines should be familiar with the more common term used to identify articulation programs and their meaning.

Barrier Removal Programs

Not all so called articulation programs are specifically designed to meet the Long et al. (1986) definition of helping students' transition from one institutional level to another. Articulation efforts which simply link two or more institutions to remove educational barriers and thereby benefit the student, are not new. Manley (1970) defined a well articulated educational program as one which provides its students the opportunities to develop to their highest potential in attaining educational as well as career objectives. The first four articulation programs meet Manley's definition of articulation by removing educational barriers.

Enrichment Programs.

Enrichment programs are usually developed by postsecondary institutions in response from one or more local school districts. Program arrangements are generally quite simple, and require the student to obtain a letter from the high school principal stating that their attendance at the postsecondary institution will not interfere with the student's secondary school work. As noted by Lerner (1987), students can receive dual high school and college credit. Students receive their high school diploma in addition to earning credit toward a college degree for participating on a full-time or part-time basis, during the regular academic year as well as during summer terms. For most enrichment programs, postsecondary credits are held in escrow for later application toward a program at the participating institution. In some cases, the earned credits may be transferred to other postsecondary institutions.

Enrichment programs are typically oriented toward accelerated students entering their senior year who plan to attend a postsecondary school after graduation. Lerner (1987) noted that enrichment programs can permit the participation of selected 10th and 11th graders. In addition to the regular postsecondary curriculum, programs could also include non-credit seminars, conferences, and workshops as summer enrichment activities.

Shared Facilities.

Having two types of schools in close proximity has the advantage of sharing selected facilities. Lerner (1987) noted that this may be particularly true when the institutions involved are required or would like to provide services or acquire expensive, sophisticated equipment and/or facilities that neither institution could provide on their own. Fully accepting the possibility of periodic scheduling problems; shared facilities are cost effective, represent the best use of equipment, and can greatly enhance the recruitment efforts.

Shared facilities typically include athletic facilities, dining facilities, libraries, and specialized classrooms and laboratories.

Combined Enrollments.

Although not as obvious between secondary and postsecondary institutions, there are advantages of having students from one or more high schools (public and/or private) enrolled in the same class. This is particularly beneficial when neither of the participating institutions have a sufficient number of students to justify offering a particular course. Dual enrollment has a great deal of merit from an economic, as well as an educational standpoint. The possibility of a secondary institution using postsecondary facilities, noted by Lerner (1987), takes advantage of the best equipment available while making possible the use of additional facilities. As an alternative, consider the possibility of distant learning and the technological advancements which are available. The opportunities to combine enrollments quickly take on a different appearance. The development of magnet school for specific courses or programs, are a variation of the combined enrollment concept.

Contracted Services.

Contractual agreements to offer classes at other institutions has a multitude of possibilities both horizontally as well as vertically. Again, the technological advancements in educational delivery systems provide a multitude of opportunities. The state of Wisconsin is divided into eleven Cooperative Educational Services Agencies (CESA) areas. Each CESA provides, among other things, contracted services which the individual, local educational agencies could not provide or justify. In specific instances, it may be desirable to have postsecondary institutions contract to provide certain advance courses taught in the high school. Contracting as noted by Lerner (1987), represents an alternative source of instructional faculty. It also provides students some exposure to alternate forms of higher education.

Credit Transfer

Few examples could be found of cooperative efforts between public secondary institutions and public postsecondary vocational technical institutions for direct transfer of credits. Such agreements, which can serve as models, do exist between public secondary institutions and proprietary occupational institutions as well as community/junior colleges.

Lerner (1987) noted, that students who complete properly developed and managed secondary vocational education program, acquire very specific skills and knowledge in preparation for employment. Some community colleges grant limited college credits for these achievements. The number of credits transferred depends on the degree to which the stated secondary competencies can be integrated into the postsecondary curriculum. Lerner (1987) indicated that 3-18 hours of credit can usually be granted at the postsecondary for secondary school preparation, depending on the particular discipline in question. The awarding of advance credits generally follow one of two scenarios.

1. Students who earn "A" grades in approved secondary courses receive the advance credit(s) directly.
2. Students who receive "B" grades in approved secondary courses, gain advanced credits through a credit by examination procedure.

In both cases, applicants for the transfer of credits must meet the college and program requirements and matriculate.

This process of transferring credits for authorized secondary courses differ from the advance placement (the next articulation program), in that the credits are accepted prior to commencement of the postsecondary course of study and are awarded as soon as the student matriculates. Spencerian College, as noted by Lerner (1987), allows the transfer of 16 secondary credits (4 classes) for courses included in Figure 1.

Figure 1. Typical secondary courses for which Spencerian College allow up to 16 credits to be transferred for qualified, matriculating students.

English
Typing
Business Law
Secretarial Accounting
Human Relations
Anatomy and Physiology
Salesmanship
Merchandise Math

Math
Shorthand - Gregg
Business Correspondence
(Figure cont.)
Accounting I
Filing and Record Management
Medical Terminology
Business Communication
Consumer Economics

Source: Lerner, (1987).

If a student from a qualified high school earned "A" or "B" grades in approved courses and could transfer 16 credits (quarter or semester) into a Minnesota or Wisconsin state college/university, it would equate to approximately $1,000 in tuition alone. For private postsecondary institutions it could be even more. This is a recruiting tool technical colleges can not currently touch. Lerner (1987) appropriately points out that:

> Traditionally, two-year postsecondary teachers have been reluctant to accept secondary learning experiences for college credit, yet these same teachers expect four-year colleges to accept their students' accomplishments without question. Often, members of the faculty believe the students are not qualified and will not do well at the

postsecondary level (p.8).

It would appear that the technical colleges Lerner (1987) is referring to, may be creating barriers to what might be reasonable considerations on their part, only to lose more than they gain.

Time-Shortened Programs

Most articulation programs are designed to facilitate advance placement in postsecondary programs for students who have mastered fundamental competencies in high school. Collectively time-shortened programs are designed to allow the student to complete the postsecondary phase faster while saving the student the tuition equivalent to the time saved. Long et al. (1986), noted that time-shortened programs were not designed to advance the students skills beyond the traditional program, and simply reduce the time required for the individual to complete the stated requirements.

Advance Placement

Often incorrectly referred to as time-shortened programs, advance placement grants students postsecondary credits for accomplishments at the secondary level. Although the credits are awarded in various ways, each of the advance placement profiles has a caveat which distinguishes it from credit transfer.

In the first profile, individuals who entered the college as secondary students in an enrichment program with aspirations for postsecondary study, are awarded advance placement. In this case, the enrichment program students essentially study certain topics in depth rather than general technical training. As they matriculate they are awarded advance placement credits only if they enroll in a program to which their enrichment program can be applied.

Breuder and Martin (1985-86), identified a second type of advance placement in which college credits are awarded for high school courses completed. Long et al. (1986) noted that this second type involved college instructors and their high school counterparts reviewing the specific course syllabuses or task lists. Upon agreement of which high school courses are more or less equivalent to introductory level postsecondary courses, matriculating students can receive advance placement with the written recommendation of their high school instructors for those competencies mastered. Breuder and Martin (1985-86) noted that in the event a matriculated student demonstrates that the competencies for which advance placement credits were awarded, have not been mastered, the student would be given independent instruction in subsequent courses to develop the deficient competencies.

The third advance placement program profile involves a appropriate skills test which allows the student to receive advance placement for demonstrated mastery.

The final advance placement profile was noted by Lerner (1987). This profile involves individual students with "C" grades who applied for credit transfer in some postsecondary institutions. Such students could receive advance placement and not receive the credit transfer until after successfully completing a specified number of postsecondary credits at the granting institution.

Career Ladder Articulation Programs

Each of the next four articulation programs has a career ladder.

One-Plus-One.

As a career ladder approach, in a One-Plus-One articulation program, the receiving postsecondary institution accepts students who have completed a one-year diploma (the first one in the one-plus-one) program at the receiving institution. A common example would be a one-year diploma from a proprietary school. Although vocational technical diplomas are not awarded at the secondary level in Wisconsin, one possible scenario comes to mind. Postsecondary articulation programs must address the individual who moves into the state of Wisconsin from a state in which vocational technical diplomas was awarded at the secondary level. Because of the wide range of programs available nationally, broad policies should provide for this consideration on a case-by-case basis.

Advanced Skills Programs.

Long et al. (1986) discusses advance skills and a common misnomer. Designed to avoid training duplication, advance skill programs streamline fundamentals to make room for the development of more advance skills. Such programs emphasize advance content aimed at graduating master technicians. The misnomer which is frequently applied to all advance skill programs--as well as some time-shortened programs, is the inappropriate use of the term two-plus-two which denotes a structured learning sequence covering grades eleven through fourteen.

To avoid the confusion associated with using two-plus-two as a collective term, it is best to use the program titles identified by Long et al. (1986) for the two main advance skills programs: (1) core curriculum (or pre-technology) programs, and (2) true vocational-technical 2+2 programs in which the entire occupational training curriculum begins in grade eleven and terminates with the student's completion of grade fourteen.

According to Parnell (1985), an advance skill program is an articulation program which joins the high school curriculum with two years of education at a postsecondary institution. If properly designed, advance skills programs can provide maximum continuity of instruction within and between educational institutions. The end product is a highly specialized and employable--some may say trained as opposed to educated--technician. Warmbrod and Long (1986) argue that the training possibilities for advance skills programming are only limited by educational resources and employment trends.

Given a favorable environment for their development, advance skills programs have unparalled advantages. One significant advantage deals with separate educational jurisdiction joining together for the benefit of students. The focused is on student outcomes which were defined in terms of student achievement levels and based on employment opportunities. The student centered orientation provides the essential ingredients for the successful development.

Core Curriculum (Tech-Prep) Program.

The main purpose of core curriculum or tech-prep programs is to produce better prepared high school graduates in a pre-technology curriculum for entry into postsecondary technical training programs. Core curriculum (Tech-Prep) programs give secondary students a broad basic background in technology--a strong core of concepts and skills--but do not restrict students to making an occupational choice in their junior year. Many such programs include agreements that enable matriculating students to bypass introductory postsecondary courses and extend the normal two-year training program by taking more advanced courses. Although the preparation is broader, Long et al. (1986) points out that the high school students still receive sufficient specific skill training for entry level employment.

Several examples of an articulated core curriculum program are now available.

1. Oklahoma City's articulation effort, which is built on the Principles of Technology, tech-prep curriculum developed by the Center for Occupational Research and Development (CORD) and the Agency for Instructional Technology. The articulation responds to community needs for more and better trained technicians for high-technology industries in the Oklahoma City area. It also is part of a local economic

development effort to attract new high-tech industries to the city (Long et al., 1986, p.5).

2. One leader in this effort is Daniel M. Hull, president of the Center for Occupational Research and Development (CORD) in Waco, Texas. CORD (1984) has developed a two-year course in applied science for junior and senior high school students that should improve their knowledge of science and math. Several secondary vocational schools throughout the nation have adopted this concept and are developing excellent course material for this 2-year sequence (Lerner,1987, p.18)
3. The CORD (1985) Advance Technology Core Curriculum Guide is an articulation effort with four post-secondary tracks for (a) laser/electro optics, (b) instrument and control, (c) robotics and automated systems courses, and (d) micro electronics course.
4. Curriculum 2000, published by the Society of Manufacturing Engineers, is an articulation effort involving secondary and postsecondary two and four year colleges and articulated curriculum development for manufacturing engineer education and engineering technology.

Vocational Technical 2-Plus-2 Program.

The Vocational Technical 2-Plus-2 Program takes a view which is focused on developing advanced skills for a high-technology occupational area during grades eleven through fourteen.

The partnership involves faculty members, administrators, and employer representatives in planning the curriculum and deciding what will be taught at each grade level (Warmbrod and Long, 1986, p.29). The curriculum arranges the study of mathematics, science, communication, technology, and specific technical skills associated with the occupational area under study to reach the master technician level of competencies through the use of a step-by-step progression terminating at the end of grade fourteen. As noted by Warmbrod and Long (1986) and Long et al. (1986), a career ladder approach is built in which permits students to exit at the end of grades twelve, thirteen, and/or fourteen.

Long et al.(1986), appropriately points out that the vocational technical 2-plus-2 program requires the blending of secondary and postsecondary resources. The process involves the development of new, comprehensive, competency-based curricula covering the four year period. Success requires the establishment of strong, mutually respectful relationships between the participating administrators as well as faculty; and the development of close, open, collaborative relationship with local businesses and industries. The partnership requires a substantial investment in planning, development and management of formal operational and financing requirements.

Horizontal Articulation

Long et al.(1986) specifically identifies one other form of articulation which should be mentioned briefly. Horizontal articulation facilitates the movement of a student from one campus or program to another of the same type. Although this types of articulation is currently negotiated at the postsecondary level, it can impact directly on secondary/postsecondary articulation efforts.

If the student participating in a vertical articulation program can now move horizontally at the end of grade thirteen, the additional flexibility can be used as a major selling point for initial entry into the vertical articulation program at the secondary level.

Overcoming Obstacles

The most common concerns about articulation programs according to Long et al. (1986), related to staff acceptance, institutional turf concerns, poor internal communication and inadequate promotion.

Following an extensive review of literature, Stewart and Heiman (1986) concluded that:

> While an increasing number of institutions were found to be working on articulation agreements, it appears that most reports described individual efforts rather than information about establishing articulation agreements. The common characteristic found in the reports related to the need to establish communication so that duplication of efforts could be minimized (p.115).

Implementing Inter-Institutional Articulation

In their study of articulation in vocational agriculture, Stewart and Heiman (1986) substantiated that even though secondary and postsecondary vocational programs (agriculture) teachers have many mutual perceptions in common, more communication should occur. Stewart and Heiman recommend that secondary teachers involved in articulation programs should: (a) learn more about postsecondary education, (b) visit postsecondary programs, (c) teach secondary students about careers requiring postsecondary preparation, and (d) refer prospective postsecondary students to the appropriate institutions. Stewart and Heiman also recommend that post secondary teachers enhance the articulation effort by promoting communication with secondary teachers. Activities recommended by Stewart and Heiman for postsecondary educators to promote articulation include (a) appointing secondary teachers to program advisory committees, (b) visiting individually with secondary teachers at their institution, (c) inviting secondary teachers to visit postsecondary programs, and (d) developing a policy for awarding college credit for documented prior learning.

In a study of secondary/postsecondary articulation conducted for the National Center for Research in Vocational Education, Long et al. (1986), also cited in Lerner, (1987) and Warmbrod & Long, (1986); determined the approaches to articulation and identified common activities as well as barriers to the process. They identified two of the general models for articulation programs, they were the time-shortened and the advance skill mentioned previously. Regardless of the model followed, the articulation programs studied had the following characteristics in common: (1) leadership and commitment must be provided from the top, (2) faculty (secondary and postsecondary teachers) must be involved early, (3) relationships must be based on mutual respect and trust, (4) the mutual benefit to all partners must be ensured, (5) articulation agreements must be in writing, (6) communication between participants must be open, clear, and frequent, (7) initial goals must be modest, (8) responsibilities must be clearly defined, (9) curricula must be competency-based, (10) the focus must be on mutual goals rather than individual/institutional interest (turf).

Lerner (1987) identifies the following twelve steps for consideration in implementing an articulation program:

1. Identify the need for and benefits of articulating with other educational institutions in your area.
2. Identify other educational institutions that would benefit from articulating with your school or college.
3. Meet with the chief executive officers (CEOs) of these organizations.
4. Assign someone the responsibility of directing the articulation effort.
5. Identify the person in the private occupational school who can certify transfer students from vocational school programs.
6. Establish clear communication channels within your institution and between and among institutions.
7. Determine the college or university degree program into

which the private occupational school students can transfer.

8. Establish whether the transfer will be granted on a course-by-course basis or on the blanket concept.
9. Develop written articulation agreements for execution at the institutional level and between program departments.
10. Begin by selecting one or two program areas that appear amenable, where faculty members have established relationships, and that have a particular need for articulation. Once these program areas are successfully articulated and the benefits made visible, use these successes to get other occupational departments involved.
11. Establish a contact person or department at each school involved in the agreement.
12. Provide secretarial support for articulation coordinator and faculty to aid their coordination, planning, and curricula development.
13. Establish a system for certifying student competencies or educational accomplishments from the articulated courses.
14. Publicize the articulation arrangements and programs to students, parents, employers, and community officials (p.18-19).

Summary

Successful articulation programs are focused on improved communication among persons at the secondary and postsecondary levels, and those policies and practices which facilitate student progress. Because of their close relationship to students on both levels, teachers are key personnel in the process. Improved articulation is a cooperative effort which must involve counselors and administrators at both levels. The success and extent to which any articulation program is negotiated involves credit or recognition for prior experiences.

Parnell (1985) also cited in Shapiro (1986), offers seven specific recommendations for developing cooperative efforts.

1. All students need a student centered curriculum. The barriers to achieving individual excellence for _all students_ must be identified and removed.
2. Unfocused learning will not produce excellence. Educational programs must provide the necessary structure and substance.
3. Students must be able to view the total educational system as providing a single, coherent program.
4. Students must see and feel a connectedness between what they do and the larger whole between education and the rest of the real world.
5. Students must experience or be able to envision a continuity in learning between one institution and another.

6. Secondary level vocational education curriculum must aim at preparing students for broad career areas rather than for specific jobs.

7. Students must see the value in and necessity to develop the competencies for continuing their learning throughout a lifetime as a means of avoiding obsolescence.

There is no single articulation program which will satisfy all situations. Open, student focused communication, is the key to successful articulation. If articulation programs are not developed between secondary and postsecondary institutions, every one loses. Vocational education programs at the secondary level may be placed at risk and the postsecondary program will fail to develop the necessary feeder programs at the secondary level. Ultimately it is the students themselves who have the most to lose. Articulation programs appear to be one key to success. By making post-secondary training programs meaningful, attainable, and more attractive to students, articulation can help keep future technicians from seeking their initial postsecondary training--and employment--outside the local area.

References

Breuder, R.L. & Martin, W.J. (1985-86, December/January). To market, to market: for twenty years. Williamport Area Community College has composed several variations on the theme. Community, Technical, and Junior College Journal, 56(3), 32-36.

Copa, G. H., Plihal, J., Scholl, S., Ernst, L., Rehm, M., & Copa, P.M. (1985). An untold story: Purposes of vocational education in secondary schools. St. paul, MN: University of Minnesota, Research and Development Center for Vocational Education.

Delaware Department of Public Instruction (1985). Applying the academics: A task for vocational education. Dover, DE Department of Public Instruction. (ERIC Document Reproduction Service No. ED 259 143).

Erekson, T.L. (1989, April). The future holds promise of continuing change. School Shop, 48(9), 20-21.

Faust, C.H. (1950). The problem of general education. In The idea and practice of general education: An account of the college of the University of Chicago. Chicago, IL: University of Chicago Press.

Good, C.V. (Ed.) (1973). Directory of education. New York, NY: McGraw-Hill.

Lerner, M. (1987). Articulation between for-profit private occupational schools and secondary vocational programs colleges and universities. Columbus, OH: The National Center for Research in Vocational Education. The Ohio State University. (ERIC Reproduction No. ED 284063).

Long, J.P., Warmbrod, C.P., Faddis, C.R., and Lerner, M.J. (1986). Avenues for articulation: Coordinating secondary and post-secondary programs (Research and Development Series No.259). Columbus, OH: The Ohio State University, The National Center for Research in Vocational Education. (ERIC Reproduction Document No. ED 051375).

Manley, F.W.(1970). Articulation between North Carolina's public system of elementary and secondary schools and public system of technical institutes and community colleges. Raleigh, NC: Research Coordination Unit in Occupational Education. (ERIC Document Reproduction No. ED 051375).

McConnell, T. R. (1952). General education: An analysis. In N.B. Henery (Ed.), Fifty-first yearbook of the National Society for the Study of Education: Part I. General Education (pp. 1-19). Chicago, IL: University of Chicago Press.

Parnell, D. (1985). The negative majority. Washington, D.C.: The Community College Press. (ERIC Document Reproduction Service No ED 262843).

Plihal, J., Johnson, M. A., Bentley, c., Morgaine, & Liang, T. (in press). Integration of vocational and academic education: Theory and practice. Berkley, CA: University of California, National Center for Research in Vocational Education.

Prosser, C. A., & Quigley, T. H. (1949). Vocational education in a democracy. Chicago, IL: American Technical Society.

Purves, A. C. (1988). General education and the search for a common culture. In I. Westbury & A. C. Purves (ds), Eighty-seventh yearbook of the National Society for the Study of Education: Part II. Cultural literacy and the idea of general education (pp. 1-8). Chicago, IL: University of Chicago Press.

Roberts, R. W. (1965). Vocational and practical arts education: History, development, and principles (2nd. ed.). New York, NY: Harper and Row.

Scott, D.C. (1985, August/September). From homeless hogs to two-plus-two. Community Technical and Junior College Journal, 56(1), 14-18.

Selman, J.W. & Wilmoth, J.N. (1989, Winter). Articulation practices and problems perceived by vocational personnel in selected secondary and postsecondary institutes. Journal of Studies in Technical Careers, 11(1), 25-37.

Shapiro, B. (1986, December). Two plus two: The high school/ community college connection. NASSP Bulletin,70(494),90-96.

Stewart, B.R. & Heiman, T. (1986, Spring). A study of articulation: secondary and post-secondary programs of vocational agriculture in Missouri. Journal of Studies in Technical Careers, 8(2), 113-121.

Van Allen, G.H. (1988, Fall). Two-Plus-Two programming: A focus on student achievement. Community College Review, 16(2), 18-23.

Warmbrod, C. & Long, J. (1986, October-November). College bound or bust: Ten principles for articulation. Community, Technical, and Junior College Journal, 57(2), 29-31.

HIGH-TECHNOLOGY TRAINING MODEL

Module Development Guidelines

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
Howard Lee
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction 338

Purpose. 338

Objectives 338

Module Guidelines 339

LIST OF FIGURES:

Figure 1. Condition Components of the Objective 341

Figure 2. Performance Component of the Objective 344

Figure 3. Product and Process Criteria. 346

Module Development Guidelines

Introduction

This module presents the guidelines used by educators participating in the High-Technology Training Model Project to develop training modules. The training modules developed new content for high school and postsecondary courses designed to incorporate competencies related to identified new technologies being used by local businesses and industries. This module was developed as part of the workshop presented to all instructors who participated in the High-Technology Training Model Project. The workshop was presented in June, 1989 at UW-Stout.

Purpose

The purpose of this module is to provide a comprehensive description of the guidelines which served as a template for educators participating in the High-Technology Training Model Project as they developed their training modules.

Objectives

This module is designed to:

1. Describe the training module development guidelines.
2. Describe the process used to change the competencies related to identified new technologies into relevant content for existing programs and courses.

Module Guidelines

The following guidelines were developed to serve as a template for participants as they developed their training module.

Title

The title portion of the module contains the name of the module. The title is based on the contents of the module being developed. It should be succinct and to the point. Other content experts should readily recognize the title as part of the content.

Description

A module course description explains what the module is about. It is written by the teacher to clarify the module, place the module in the sequence of the course, specify if any prerequisites are needed, and suggest the kinds of typical activities that students can expect. It should be short and concise. If the module is articulated between courses within a school, or between the secondary and/or postsecondary level, it should be noted here.

Name and School

The person(s) who developed the module, and the name of the school and address are identified. This will facilitate contact if other instructors who might utilize the module have questions.

Objectives

Purpose of Objectives.

Objectives describe in precise terms what the content will be and what responsibilities students will have. They usually suggest the nature of evaluation. Objectives provide the road for all learners and teachers. They tell you where you're going and when you have arrived. Module and specific objectives were reviewed for this project.

1. The module objective states the intended purpose (overall outcome) expected of each student after completion of the module of instruction. A well stated module objective is usually stated in three parts; the condition, performance and criteria component.

2. Specific objectives are the subordinate objectives that state what the student must achieve in order to reach the module objective.

Benefits of Objectives.

Many benefits of objectives may be listed. The following are the main benefits discussed in the project:

1. When students are provided with well-stated objectives, they know exactly what will be expected of them. They know what they must learn, under what conditions, and how they will be evaluated.

2. If the objective is well written, any instructor can examine it and determine what kinds of learning activities might be appropriate for learning the objective.

3. A well-written objective also reveals the major learning materials and resources (tools, equipment, supplies, etc.) needed for learning the content.

4. Well-stated objectives tend to help everyone involved

(teacher, evaluators, aids, media specialist, etc.) in the teaching-learning process to understand what the student is attempting to do.

5. By informing learners of the objectives of the session, learning is enhanced.

6. Precision in the instructional process is enhanced if the objective is stated. Well-stated objectives remove the ambiguity in the learning process. By stating the conditions under which the learner must perform, exactly what performance is required, and the specific criteria for evaluation, the fuzziness out of both the teaching and the learning process is reduced.

Components of Objectives.

1. **The Condition Component:**

a. The condition component of the objective describes the setting in which the student will be required to perform the task to demonstrate learning. The condition is often referred to as the given and should be written just as carefully for cognitive, psychomotor, or effective objectives. The Figure 1 provides examples of the condition component.

Figure 1. Condition Components of the Objective

1. **Things**
    - a. Given specific tools
    - b. Given materials or consumable supplies
    - c. Using test instruments, manuals, specifications, etc.

(Figure cont.)

d. Given a drill, sterilizer, or other specific piece of equipment

e. Provided with mock-ups, devices, etc.

f. Given objects encountered on the job - soil, broken belt, patron, recipe, etc.

2. Situations

a. Using actual work

b. Under some specified situation

c. Presented with picture, problems, case study

d. Given a work order, verbal instructions, blueprint, etc.

e. Provided with results of a diagnostic test

f. Provided with the data, measurements, parameters, map, schematics

g. Given lists of terms, parts, tools, etc.

h. Given a field situation

i. Given numbers, figures, or problems

3. Restrictions

a. Without the use of texts, books, manuals or references

b. Without any aid

c. Without specific tools and equipment such as calculator, special tools, tables, charts, etc.

---

b. The following tips might be helpful in writing the condition component of objectives:

(1) Avoid a long list of specific tools and equipment. This generally has little use and prevents the objective from becoming so long.

(2) Do not include any objects, situations, or restrictions that are obvious to all concerned, such as "given a laboratory, welding gloves and tanks." Do mention any special restrictions under which the students will have to perform.

(3) Do not include anything in the condition that the learner should not have during the testing situation. If the student is required to determine what materials are needed before performing a task, do not list these materials in the condition.

(4) Avoid indicating reference to how the student will learn the task. Do not use phrases such as "given a lecture on," "given the required reading materials," and so on. The condition focuses on the evaluation/testing situation - not the learning situation.

(5) Do not make the condition too specific. For example, "given two pieces of wood, 4 inches by 4 inches," might be too restrictive. "Given two pieces of material," would probably be sufficient.

(6) The condition should resemble the condition under which the student must perform the task. If a worker must be able to write up a purchase order on the job from verbal orders, then "given verbal orders . . ." should be the condition specified in the objective.

2. The Performance Component:

a. The performance component is nothing more than the task or competency statement. However, the task statement may be expanded, additional qualifier added, or altered to describe the performance accepted in the education or training setting. Figure 2. provides examples of the performance components. Note that the task statement has been expanded or made more specific.

Figure 2. Performance Component of the Objective

	Tasks	Performance Component of Objective for that Task
1.	Lay out a rafter	lay rafter to span 12 feet
2.	Clean, gap, and test spark plugs	remove, clean, and gap the plugs and replace in engine
3.	Prepare purchase order	take verbal order, type, and check account code
4.	Install transmission	install and perform checks

---

b. Consider the following when dealing with the performance component.

(1) Make sure it includes the task or competency statement.

(2) Have another teacher describe exactly what the student should be able to do to demonstrate mastery of the task. If they can, you have the performance clear.

(3) The performance component should describe the

final (terminal) testing situation for the student to be considered competent.

(4) Keep the instructor performance separate from student performance. Never use "will teach," "will demonstrate," etc., or other instructor behaviors. We are interested in student performance.

3. **The Criteria Component:**

a. The criteria component focuses on how the learner will perform the task for the teacher to conclude that the task has been accomplished (job entry level). Students can perform almost all criteria of a task except perhaps one--speed. Figure 3 provides examples of product and process criteria.

b. The following tips may be helpful in writing the criteria component of the objective:

(1) Keep the criteria at a level to ensure entry-level job employment by the student or pre-requisite for the next objective.

(2) Reduce the criteria dealing with speed as would be required for an experienced worker performing the task on the job.

(3) Do not connect the criteria to instruction. Do not use phrases such as "following criteria in textbook" or "according to specs in handout." These resources will change - criteria should not.

(4) Speed may be important on the job. If it is mentioned, a reasonable time limit in the criteria (or include

time as an item on the performance test).

Figure 3. Product and Process Criteria

Product Criteria		Examples
	*	+0.004 inch, +1 mm, +3 degrees
(The finished product)	*	According to manufacturer's specs
	*	Within 8% of actual reading
	*	Within 99% accuracy
	*	With no errors
	*	Must agree with instructor's measurements
	*	To customer's satisfaction
Process Criteria	*	Following manufacturer's
(How the student performs the task)	*	Within 20 minutes
	*	Not exceeding flat-rate time by more than 30%
	*	Performing all steps in sequence
	*	Following safety practices

Content Outline

The content outline is usually the beginning step in the development of a module. It is a skeleton framework of the module content developed by the teacher. It is similar to a topic outline but dealing with the content to be covered in the module. The teacher may use a variety of resources to develop the module, such as another outline as a base, a personal analysis or existing materials or guides. A third level content outline is usually sufficient to determine the main concepts in the module are being covered.

Methodology

This section provides examples of teacher actions to accomplish the objectives of the module. How the teacher will facilitate the activity(ies) to accomplish the objectives listed in this section.

EXAMPLES 1.

1. Obtain additional materials
2. Make transparencies
3. Write worksheet
4. Provide students with objective sheet

Additional suggested activities should be listed as needed.

EXAMPLES 1. Relationship to Objective.

The activities identified in the module should be directly related to the objective or sub-objective of the module. In fact, as stated in the objective section, a well-written objective will also include what the student will do to learn the material.

EXAMPLE 2. Be Specific to the Student.

The activities identified in the module should also include the kinds of things that students will be engaged in to learn the content. Will students be involved in:

1. Demonstrating something to other students
2. Identifying parts
3. Testing a circuit developed
4. Writing a report
5. Programming a routine
6. Recalling information

Resources

Resources are references needed by students and or teacher to accomplish the objectives of the module. They are identified in this section. Someone not familiar with the content can easily determine the special materials needed to teach the module. Resources may include:

1. Books
2. Pamphlets
3. Films
4. Brochures
5. Maps
6. Materials
7. Equipment
8. Supplies, etc.

Evaluation

The evaluation used must be related to the module. It should be based on the objective and the performance standard noted in the objective. The objective may call for cognitive information or a skill.

Paper and pencil test is usually used to measure the knowledge of the student. This test may take the form of an essay, multiple choice, true false, etc., test to measure the students knowledge.

Process/Product evaluation is basically a performance test. In process evaluation, the teacher evaluates the student as they complete the activity. In product evaluation, the completed project is evaluated using pre-determined criteria. In any case, the evaluation criteria should be identified and listed in this section. Any exams, product or process checklists developed should be included. Remember: These modules will be shared with various teachers in the field.

HIGH-TECHNOLOGY TRAINING
MODEL MODULE

Evaluation

Developed as a part of the High-Technology Training Model for rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151.

Prepared by:
James P. Breen, Orville Nelson and J. Timothy Mero
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 352
Purpose 352
Objective 352
Systems Approach to Evaluation. 353
Evaluation System for Industry Based Training Programs. . . .357
References. 360

Appendices

A. Measurable Objective 361
B. Training Module Evaluation Forms 363
C. Designing Evaluation to Improve Training Programs. . . .367
D. Statistics and Control Program - Evaluation Form 393

Evaluation

Introduction

Proper evaluation is a major key to the success of any education or training program. As learners, students and trainees must be given feedback as to their progress, and educators and trainers must be able to properly judge the learner's preparedness to begin a task or job.

Evaluation of the learner may be very simple or very complex depending on the depth of the program and the level the learner is at. It is imperative that the educators and trainers knows how to match the type of evaluation to the program to be taught.

Educational Program Evaluation

Evaluation is an essential element for the improvement and strength of any program and course. Learner, educator/trainer, and management feedback are all important factors in building a strong and sound program.

Purpose

This module is designed to provide the information needed to write complete measurable objectives, match the learner evaluation techniques to objectives, and selection of evaluation methods best suited for a given program.

Objectives

The objectives for this module are:

1. Write a clear measurable objective.
2. Write an evaluation scheme that properly matches the objective.

3. Evaluate learning situation using a variety of methods.

Systems Approach to Evaluation

Measurable Objectives

Good, clear, measurable objectives which are understood by educators/trainers and alike, form the foundation for a successful evaluation plan.

Measurable Objectives must have:

1. Condition - Under what conditions is the task to be done?
2. Intent - Exactly what is the task the student/trainee is to do? Usually described in terms of an action verb.
3. Level of performance - What is the standard or to what degree must the task be performed?

Appendix A contains a model depicting the elements of measurable objectives. For more information on objectives and the domains and taxonomies of learning, see Gronlund (1985), Stating Objectives for Classroom Instruction

Measurable objectives are based on the knowledge, skills and competencies required to perform a task, solve a problem or make a decision.

Evaluating Learners

Various Ways to Evaluate Student's Performance.

1. Tests
    a. oral
    b. written
        (1) essay
        (2) objective

(a) true and false

(b) multiple choice

(c) matching

(d) completion

(e) listing

(f) identification

- drawings
- actual object

2. Observation instruments or techniques

    a. progress charts

    b. rating scales

    c. checklists

    d. interviews

3. Gronlund (1985) and Green (1975) provide good examples of these tests and instructions for their development.

Matching Evaluation Methods to Performance.

One must remember to select the type of evaluation based on what the objective requires. Two examples follow.

Example 1:

Objective: Without the aid of reference material, relate how the first amendment affects our lives today.

Poor Evaluation: Write the first amendment.

Good Evaluation: State the first amendment, then write three short essay examples of how the amendment is being used or abused today.

Example 2:

Objective: Given a malfunctioning radio, the student will be able to repair the radio to proper working condition.

Poor evaluation: List five items that may cause a radio to malfunction.

Good Evaluation: Give the student a malfunctioning radio and have them repair it. The student will be evaluated based on if the radio works properly or not. Also, factors such as the time required to fix the radio, could be included in the evaluation.

Mastery/Competency Based Evaluation.

Mastery/Competency based evaluation evaluates the individual's performance as compared against the acceptable minimum criterion. The following example is provided.

Example:

Objective: Given a PC and typical business documents, the student will be able to key enter 70 wpm with three or fewer errors.

Valid Evaluation: Give the students a typical business document, a PC, and have them enter text for 10 minutes. Print a copy of text entered and calculate the wpm and count the number of errors per 70 words.

For more information on learner evaluation refer to Mager (1984), and Green (1975). For more information on mastery/competency based evaluation, refer to Blank (1982).

Evaluating Learning Programs

Three Ways To Rate Training Success.

1. Contribution to goals - How much has the education/training helped with the organizations performance problems?

Example: Company "B" produced 100 widgets per hour. After training, company "B" produced 150 widgets per hour. Training contributed 50 widgets per hour.

2. Achievement of learning objectives - This type of evaluation requires that each learner be tested on each learning objective listed for the program.

The evaluation include post-training measurement of actual on-the-job use of the new behaviors or the direct application in an appropriate academic environment.

Objective	1	2	3	4	5	6	7	
1	X	X	X	X	X	X	X	
2	X		X	X		X	X	36 of 49
3	X	X		X	X	X		objectives
4			X	X	X		X	were met.
5*	X					X		
6		X	X	X	X	X	X	

Note:* One should note that only 2 out of 7 students achieved objective #5. The educator/trainer may want to look into this objective more carefully.

3. Evaluation by perceptions

   a. Ask opinions of students on:

      (1) content

(2) instruction

(3) facilities

(4) interest

(5) appropriateness

b. Ask open ended positive/negative questions

c. Likert scales

(For information on statistical interpretation of likert scales, reference any statistics book.)

Examples: High-Technology Training Model Project, Training Module

- teacher's module evaluation
- student's module evaluation
- module development evaluation

Copies of these forms are included in Appendix B, as examples.

Evaluation System for Industry Based Training Programs

Introduction

Program and trainee evaluations are also important for industry based training programs. The evaluation principles discussed in the first part of this module are equally applicable to the designs of evaluations systems for industry based training programs. Valid evaluation techniques are essential. To achieve this one must have specific objectives and appropriate evaluation techniques.

There are some differences, however. Often adults are afraid of tests and do not want to be graded on an A, B, C, etc.

basis. This is especially true if they have not been "in school" for awhile. Also, written tests are not always the most appropriate measuring technique.

Application of a systems program is usually very helpful. The systems model directs the trainer to the most critical variables to measure and helps to identify relationships between inputs, processes and outputs.

Designing Evaluation to Improve Training Programs

Evaluation is a two-edged sword. The information provided from an evaluation can generate feedback for learners that reinforces their work, help instructors improve their training program, and give managers data that help them determine the value of the training program.

Evaluation can also have negative effects. It can cause trainees to become anxious and lose interest in training activities. Instructors can become wary of the outcomes of the evaluation and the potential impacts on their work. Supervisors and managers can become concerned that an evaluation will undermine a training program they feel is important.

An effectively designed evaluation can draw upon the strong points just mentioned and avoid the negative aspects. Participants in training programs need feedback to provide reinforcement and help them determine the outcomes of their work in the training activities. In like manner, trainers need to know the impacts of their training activities and have information that will help them improve their training programs.

Supervisors and managers need to have feedback on the impacts of the training programs they have sponsored.

The first part of Appendix C describes an evaluation system that was used in a series of twelve training programs provided for a large corporation. The evaluation proved to be effective in providing information that was useful to the trainees, helped the instructors improve the workshop design and content, and assisted managers in assessing the value of the training program.

The second part of Appendix C presents more general concepts concerning the design of evaluation systems for training programs. Also, the evaluation described in the first part is expanded to include a follow-up phase.

References

Blank, W. E. (1982). Handbook for Developing Competency-Based Training Programs. Englewood Cliffs, NJ: Prentice-Hall.

Green, J. A. (1975). Teacher-Made Tests (2nd ed.). New York: Harper & Row.

Gronlund, N. E. (1985). Stating Objectives for Classroom Instruction (3rd ed.). New York: Macmillan.

Laird, D. (1985). Approaches to Training and Development (2nd ed.). Reading, MA: Addison-Wesley.

Mager, R. F. (1984). Measuring Instructional Results or Got A Match (2nd ed.). Belmont, CA: David S. Lake.

APPENDIX A

Measurable Objectives

Measurable Objective's

Conditions of Performance	Instructional Intent	Level of Performance
States under what conditions the student will be able to perform.	What we expect the student to be able to do.	Provides a minimum standard of achievement.
• Given a problem of the following class... • Given a list of... • Given any reference of the learner's choice... • Given a matrix of intercorrelations... • Given a properly functioning... • Without the aid of reference... • Without the aid of slide rule...	• To write • To recite • To differentiate • To solve • To identify • To construct • To list • To compare • To contrast	• Identify all... • State three... • Cut within ± of 1/4" • Remove 60% of...

At the completion of this lesson the student will be able to:

- Given the Paxton sample of the 35 most common woods, the student will be able to identify all the woods in the group of samples.
- Given the carburetor specification of Ford Motor Company, the student will be able to state the two different jet sized found in carburetors made by the Ford Motor Company.

Dr. Richard Gebhart
UW-Stout

APPENDIX B

Training Module Evaluation Forms

- Teacher's Module Evaluation
- Student's Module Evaluation
- Module Development Evaluation

8/23/89

TEACHER EVALUATION
HIGH-TECH MODULE

TEACHER ______________________________ DATE ______________

ULE TITLE ____

DATE(s) USED ______________ CLASS(es) ____________________

TIME REQUIRED TO COMPLETE THE MODULE (MINUTES) ______________

Directions: Please list the information requested above. Then read each statement below and respond based on your experiences with the module. Use the following responses.

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

If you have any comments, write them by the statements or at the end of the form.

	Responses/Comments				
EVALUATION STATEMENTS	SD 1	D 2	U 3	A 4	SA 5
MODULE					
1. The Module was easy to use....................	1	2	3	4	5
The Module was complete.......................	1	2	3	4	5
3. Objectives were clear.........................	1	2	3	4	5
4. Activities in the Module were effective in stimulating learning.........................	1	2	3	4	5
5. Audio visual aids and/or resource materials were effective...............................	1	2	3	4	5
6. I had the classroom and lab equipment required to effectively use this Module.......	1	2	3	4	5
7. Evaluation procedures were effective..........	1	2	3	4	5
8. This Module introduced new content, concepts, skills, etc. in my class...........	1	2	3	4	5
9. The knowledge and/or skills students learned are relevant to the needs and trends in industry..........................	1	2	3	4	5
10. This Module fit well with the rest of my course content..........................	1	2	3	4	5

STUDENT EVALUATION FORM

SCHOOL ________________________ DATE ____________

CLASS ________________________ MODULE ________________________

Directions: Read the statements on the left. Use your experiences in the unit just completed in class to answer each statement. Use the following responses. There is space for comments at the end.

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

		Responses				
	EVALUATION STATEMENTS	SD 1	D 2	U 3	A 4	SA 5
1.	I liked this learning unit......................	1	2	3	4	5
2.	I learned some useful things....................	1	2	3	4	5
3.	The learning activities were interesting........	1	2	3	4	5
4.	The activities, tasks, and/or assignments were helpful................................	1	2	3	4	5
5.	I learned some things that will be useful in the future..................................	1	2	3	4	5
6.	I learned some new things.......................	1	2	3	4	5

7. What was the most important thing you learned?

8. How could this unit be improved?

HI-TECH TRAINING PROJECT

MODULE EVALUATION FORM

M[illegible]E NAME. ____________________

Scale: 1 = Needs Improvement
2 = Satisfactory
3 = Very Good

Dimension	Rating	Comments
1. TITLE:		
The module contains a name.	1 2 3	
2. DESCRIPTION:		
Information is provided as to where the module fits in a sequence of a unit/task/course	1 2 3	
3. OBJECTIVES:		
A. Module objective is stated.	1 2 3	
B. Specific objectives are listed.	1 2 3	
4. CONTENT OUTLINE:		
A first. second and third order outline of the content is presented	1 2 3	
5. ACTIVITIES:		
Are identified which will help students learn the content	1 2 3	
6. RESOURCES:		
A variety is listed which will help students/teachers accomplish objective. . . .	1 2 3	
7. EVALUATION:		
A. Evaluation criteria identified.	1 2 3	
B. Evaluation procedures given	1 2 3	

ADDITIONAL COMMENTS:

APPENDIX C

Designing Evaluation to Improve Training Programs

Designing Evaluations to Improve Training Programs

Evaluation System

The following evaluation system was developed to evaluate a statistics and process control training program. The program was forty hours in length and conducted during a two-week time period. trainees attended morning or afternoon sessions. Training was conducted on-site.

The goal of the company was to develop an effective quality program throughout all departments. Thus, a cross-section of employees in a department or plant site was enrolled in each training program. As a result, participants had a wide range of educational levels, statistical expertise, and technical knowledge. Ages ranged from those in their early 20's to people near retirement.

Evaluation Design

A pre and post-test design was used in order to identify gains in knowledge during the training program. A cognitive test was developed for the training program and was used as the pre and post-test. Copies of the test were sent to the on-site coordinator for the training program. This person distributed the tests to the prospective trainees and collected and returned the completed tests to the trainers two weeks prior to the start of the training program. This allowed the pre-test to be analyzed and the instructors to review the results before initiating the training. Adjustments in the training program content and pace of instruction could be made based on the test results.

In order to reduce test anxiety, trainees were not asked to place their names on the pre or post-test. Instead, a 3 X 5 card with a number on it was clipped to each of the pre-tests. The same number was recorded on the test booklet. Trainees were asked to keep the card and place this number on the post-test when it was given at the end of the training program. A few trainees forgot to retain their numbers; however, overall the process worked quite well. there was no indication of test anxiety or concern over how the test results might be used by the trainers or supervisors.

During the last session of the training program, the post-test was administered. This was the same test as used in the pre-test. An alternative form of the test probably would have been more appropriate in a measurement sense. However, the time and economic considerations, and activities required to develop and certify a parallel form of the pre-test made it impractical to do this. The questions on the pre-test may have sensitized the participants to some topics, however the participants did not comment on or ask about the questions on the pre-test during the training programs.

After the post-test had been administered, the participants were also asked to complete an evaluation form on their experiences in the training program and their perceptions of the usefulness of what they had learned. participants did not have to place their names on this survey form. They were also encouraged to make suggestions for how the training program could be improved.

Test Validity.

In order to assure that the cognitive test contained appropriate or valid items, the training program objectives were analyzed to identify the types of competencies participants would need to have in order to meet these objectives. For example, one of the objectives was that the participants would develop a knowledge of basic statistics to include proportion, range, mean, standard deviation, median and mode. This objective was analyzed and the following knowledge levels were determined.

LEVEL	SAMPLE COMPETENCIES
Knowledge:	Identify the symbols and list the formulas for the basic statistics.
Application:	Given a set of data, calculate and interpret the appropriate statistics.

After this analysis had been done, it was a relatively simple task to write test items to measure knowledge or understanding of the topics related to each objective. A multiple choice test item format was used to simplify and speed up test scoring. Item analyses were regularly run on each of the tests. these item analyses were reviewed to determine any items or responses which needed to be revised. One or two revisions were made after the first training program. In addition, these reviews identified typical errors trainees made on the test questions.

The second instrument developed to evaluate the training program was a rating scale. A systems analysis was done on the training program to identify components which should be evaluated in the rating scale. A majority of the items in the rating scale dealt with the processes and resources used in the training program. For example, participants were asked to evaluate whether the instructors were able to effectively answer their questions and if the training materials were useful. A few of the items were concerned with inputs and outputs. For example, participants were asked to rate the statement "I learned a lot in this training program." A copy of this rating scale is included as Appendix D to this module.

Selected Results.

More detailed results for one of the training programs are given in this section. A comparison or pre and post-test results for several of the training programs will also be given at the end of this section. these results are being presented to give an idea of the types of analyses that can be used and the information available from the evaluation of a training program.

Before looking at the pre and post-test comparisons, I want to mention that the pre-test item analysis for each group was reviewed to identify the participants' strengths and weaknesses. The item analysis presents a summary of the participants' responses to each item in the test. Therefore, it is possible to determine concepts that are known by almost all of the participants and those that only a few participants know. This information was used by the instructors to adjust the content and pace of instruction.

After each training program had been completed and the post-tests scored, the post and pre-test scores were compared to identify gain scores. Only the participants with both pre and post-test scores were included in this analysis. This restriction could create some potential biases. More detailed analysis were done to determine potential impacts of this restriction. It was found that some of the individuals who took the pre-test were not able to participate in the training program. In some instances, participants forgot their number and were unable to place it on the post-test. A few participants missed the last session of the training program. And, a few participants did not take the pre-test. An analysis of the average pre-test scores for those who did not take the post-test revealed that this average was not significantly different from the pre-test scores of those who had also taken the post-test. A similar analysis of the average post-test scores for those who did not have pre-test scores revealed that there was no significant difference when contrasted with the average score for those who had taken both pre and post-tests. Based on these analyses, the author concluded that if any biases were present, they were small in size.

Table 1 presents the pre-test, post-test and gain scores for the participants in one of the training programs. Gain scores are determined by subtracting an individual's pre-test score from his/her post-test score. A minus score indicates a post-test score that is lower than the pre-test score. (See trainee 34) The average gain score for this group was 8.18 points. this may not appear to be a large change; however, it was a 39 percent increase in performance and was statistically significant. In other words, it was very unlikely this difference could have occurred by chance. Also, the test items were based on a sample of the competencies gained and these did not enumerate all of the new knowledge acquired. There were forty items on the test.

A correlational comparison of pre and post-test scores was also run for each training program. An example of the scatter diagram for the data in Table 1 is given in Figure 1. This analysis indicates that those who have high pre-test scores also tend to have high post-test scores. This is a logical outcome for an effective training program. Those who enter with more knowledge should be able to maintain this edge.

A comparison of the participants' gain scores with pre-test scores is given in Figure 2. This analysis indicates that individuals with the lower pre-test scores tended to have the larger gain scores. Again this would appear to be a logical outcome from an effective training program. First, the fact that those who had low pre-test scores, or less knowledge, were able to gain substantial amount of knowledge is a positive outcome and would indicate that the training program did not go over their heads. On the other end of the spectrum, those with high scores also gained knowledge. It must be remembered that they did not have as much space on the measuring instrument to show gains as those with low pre-test scores. In essence, they are capped from showing substantial gain scores.

A summary of the participants' evaluation of the training program is given in Table 2. The mean, standard deviation and percentage of participants that agreed with each statement are given in the table. The average response represents the typical feeling of the group. Variations in reactions, opinions or feelings are represented by the

TABLE 1

Pre-Test and Post-Test Results Statistics and Process Control Training Program

Trainee #		Test Results Post	Pre	Gain Scores
2		30	26	4
3		31	23	8
4		28	15	13
5		26	17	9
6		36	29	7
7		35	23	12
9		26	21	5
10		36	25	11
11		20	8	12
12		25	16	9
13		26	21	5
14		25	13	12
17		22	16	6
19		33	27	6
22		29	16	13
24		27	23	4
25		30	26	4
26		27	19	8
28		25	18	7
29		33	16	17
31		27	19	8
34		17	20	-3
36		22	21	1
37		29	22	7
38		30	11	19
39		40	25	15
40		31	22	9
41		27	18	9
42		34	29	5
44		32	26	6
45		33	23	10
46		25	19	6
47		43	37	6
	X	29.09	20.91	8.18
	S	5.52	5.76	4.45
	N	33		

#Scores for persons who completed the pre-test and post-test.

o t test of differences: $t = 10.568$
$p < .001$

* Conclusion - There was a significant gain in knowledge.

Figure 1:
Comparison of Pre and Post-Test Results

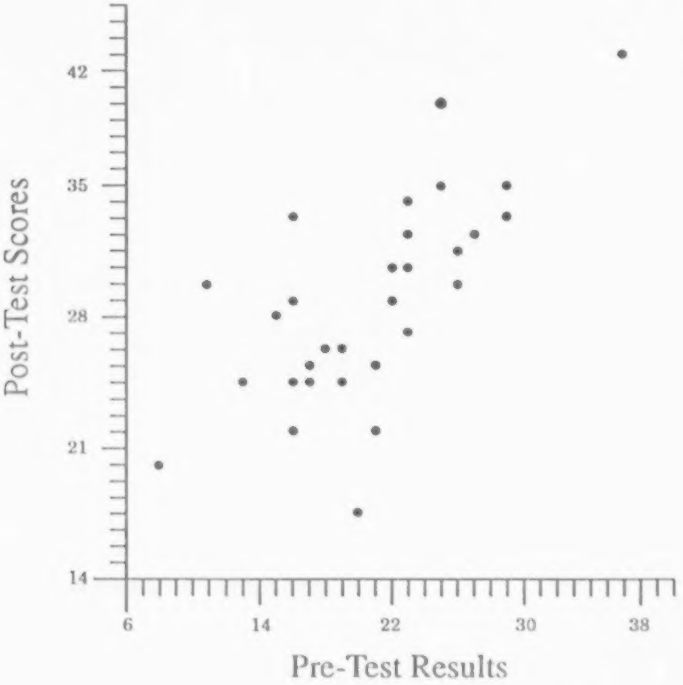


Figure 2:
Comparison of Pre-Test and Gain Scores

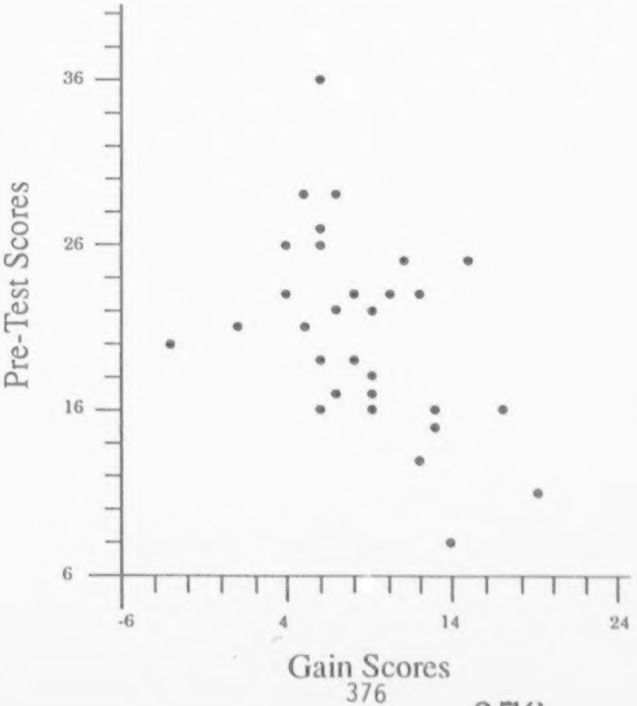


TABLE 2

Participants' Evaluation of Training Program

Characteristics of the Training Program N=33	Results X	S	% Agree
1. This program was worthwhile	3.9#	.8	77@
2. I enjoyed using MINITAB	4.0	.9	77
3. MINITAB can be helpful in my work .	3.5	1.1	47
4. I gained a better understand of statistics	4.2	.9	86
5. I will be able to use the contents of this training program.	3.5	.9	50++
6. I liked the opportunity to work with my own data.	4.1	.7	84
7. There should be more opportunity to apply the contents to practical problems related to my work	3.5	.9	46
8. I knew most of the content of this training program before we started the sessions.	1.7	.9	7
9. I learned a lot.	3.8	.9	64
10. The instructors' explanations were clear	4.2	.6	93
11. The instructors effectively	4.1	.7	82
12. The instructors were able to relate the content of this training program to practical problems . . .	4.1	.8	87
13. The instructors were well prepared.	4.3	.7	59
14. I plan to use some of the techniques presented	3.7	.7	59
15. Too many topics were included in the program	3.0	1.1	27

TABLE 2 (Continued)

Characteristics of the Training Program N=33	Results		
	X	S	% Agree
16. Too few topics were included in the program	2.6	1.1	14
17. The visuals used were helpful . . .	4.1	.9	86
18. The handouts were helpful	4.3	.7	95

KEY

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

@ Percent of respondents who agreed or strongly agreed with the statement.

++ 11 percent disagreed with this statement.

standard deviation. The larger this number the greater the variation in responses given by the participants. When this number is 0 it indicates that all participants have selected the same response. The percent agreed (% agreed) column is a combination of the percentage of participants that marked the "agree" or "strongly agree" response on the rating scale. For example, 77 percent of the trainees selected the "agree" or "strongly agree" response for item 1, "This program was worthwhile."

A review of Table 2 indicates that the training program content, materials and instructors received consistently high ratings. The pace of instruction appeared to be fairly appropriate. (Note items 15 and 16.)

Participants reported that they enjoyed using the MINITAB Software (Item 2), gained a better understanding of statistics (Item 4), and planned to use some of the techniques presented (Item 14).

Many participants also indicated an interest in more opportunities to work with their own data (Item 7). In each training program, participants were encouraged to bring in samples of the data with which they worked. These were woven into problems during the training workshop. However, there were limitations on the amount of time that could be given to working with their data versus developing new concepts.

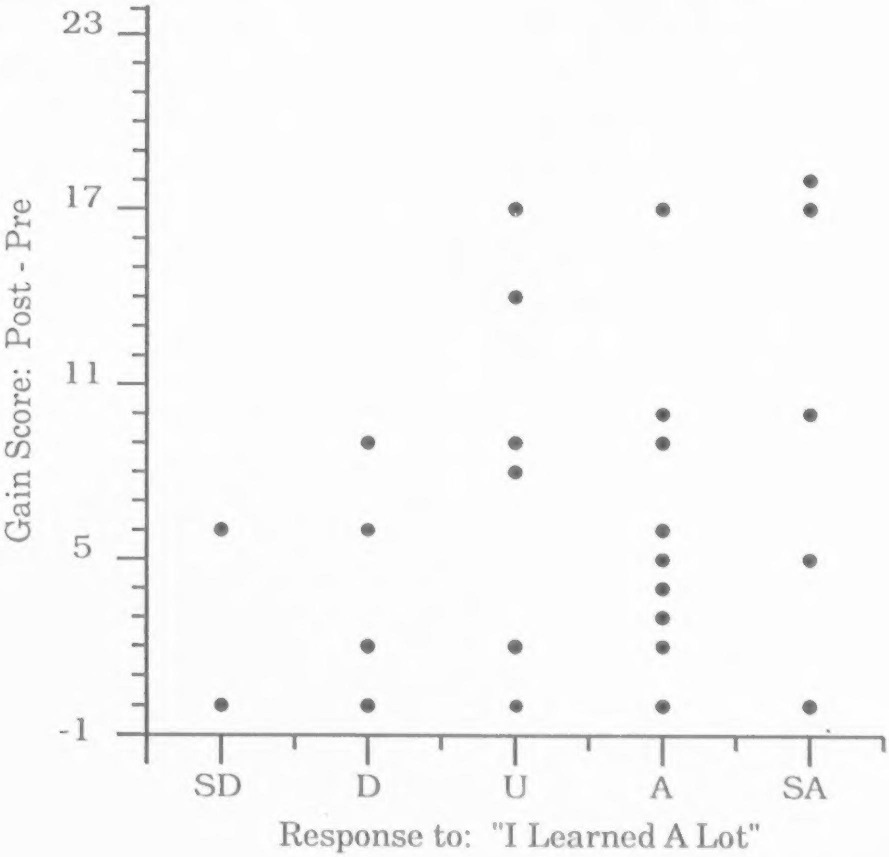
The training program instructors found the rating scale feed back to be very helpful. It provided a concise summary of the participants' feelings and opinions related to their experiences. Their responses to the items and written comments at the end of the survey also provided information that was useful in modifying the training program.

Perceptions Versus Test Results.

Out of curiosity, the author did a special analysis contrasting participants' opinions of the amount of knowledge they had gained during the training program with the actual test outcomes. This was done in a selected training program and was not completed for each of the twelve evaluations. In this training program, participants were asked to place their ID numbers on the opinionnaire as well as the test. A visual

Figure 3:

Telationship Between Gain Scores and Trainees' Perceptions of the Amount They Learned



comparison of the relationship between perceptions and test outcomes is given in Figure 3. The correlation between the perceptions of the amount learned and gain scores was .25. This correlation would have been higher if those who perceived that they had "learned a lot" had consistently high gain scores. However, several of the trainees who indicated they "learned a lot" had moderate to low gain scores.

It would appear that in situations where the participants do not need to identify themselves and are free to respond based on their perceptions, that they can give a moderately accurate indication of the amount they have learned. It is very unlikely that this relationship would hold true if there was pressure for grades, merit ratings, or certification.

Comparison Groups.

Because of the nature of the training program and the settings in which the training programs took place, it was not possible to identify a control or comparison group. In each setting, most of the staff of a department or plant site were involved with the training program. A quasi experimental design could have been used with a comparison group selected from another department or plant site. However, logistics and cost precluded the use of this option.

The host company's decision to provide this training program at a variety of plant sites made it possible to use a modified time series evaluation design. In this design, outcomes are contrasted over a period of time to determine if there are consistent patterns. If the training program is effective, one would expect that the changes between pre and post-test scores would be similar in all groups. In other words, and effective training program would have significant gain scores in most, if not all, training sites. This was true in the twelve settings in which this training program was offered.

It should be noted that in this type of analysis that it would be possible for a pre-test average score in one group to be higher than the post-test score in another group. This could occur when one group has had very little exposure to statistics and process control while another group has had extensive prior experience with these areas. There were differences in average pre-test scores from setting to setting as depicted in Table 3 which presents the test results from several of the training programs.

If necessary, an analysis of covariance could be used to statistically equate the pre-test scores for the groups. The type of statistics used will depend upon the variations in the groups involved and the amount of statistical sophistication desired by the decision makers involved with the training program. In many instances, a visual review of the gain scores for each of the training programs will be enough to indicate whether a program is effective.

TABLE 3

Test Results From Eleven Training Programs

Training Program	Average Test Results			t Value	Decision
	Pre	Post	Gain		
A	27.9	34.2	6.3	9.87	SIG GAIN
B	20.5	26.8	6.3	7.48	SIG GAIN
C	28.4	35.2	6.8	8.78	SIG GAIN
D	21.3	29.6	8.3	7.24	SIG GAIN
E	26.2	33.0	6.8	5.9	SIG GAIN
F	27.6	35.4	7.8	9.61	SIG GAIN
G	26.1	32.3	6.2	7.05	SIG GAIN
H	20.9	29.1	8.2	10.06	SIG GAIN
I	20.7	27.8	7.1	7.26	SIG GAIN
J	19.9	26.3	6.4	7.67	SIG GAIN
K	22.8	29.1	6.3	13.3	SIG GAIN

#Decisions are based on the results of the t test of differences. All t tests were significant at the .01 level.

Summary

This evaluation system was designed for a specific training program delivered on-site in a variety of locations throughout the United States. It was planned to provide information that could be used by the trainers, participants and managers. Major goals of the evaluation were to identify how effectively the training program was meeting its objectives, provide feedback for the trainers and to generate information that could be used by management in determining the value of the program.

From the perspective of the trainers, the evaluation system was successful. Information from the test and the rating scale was very useful in refining the design of the training program and communicating its impacts to management. Participants did not indicate any negative reactions to the evaluation process and many asked to receive their test scores.

General Design Principles

This section presents major factors that should be considered in evaluating a training program. These would apply to the evaluation of most training programs.

Relevant and Useful Data.

The evaluation must produce data that are of value to trainers, trainees and managers. Trainers need to know the trainees' entering level of competency, progress in the program and exit level of competency. They will also want to know the trainees' reaction to the program. Trainees are interested in their progress and the degree to which they have met the objectives of the training program. Managers will want to know what competencies have been acquired, areas in which more training is needed, and their staff members' reactions to the training program.

The starting point for the design of the evaluation is a valid set of training objectives. These objectives will clearly define the exit competencies of participants in the training program. They should be based on a needs assessment that identifies and prioritized the competencies required to improve quality and performance. The evaluation must determine the degree to which these objectives have been attained.

Information needs of the trainers, trainees and managers should be kept in mind as the evaluation is designed. It may be necessary to discuss these needs with representatives of each group. As the evaluation is designed, the evaluator must keep in mind the following two questions: (1) What information is needed?, and (2) When is it needed?

Design To Fit The Situation.

During the design process, consideration must be given to a variety of situational factors that influence the outcomes of the training program. For example, the interests, capabilities and job responsibilities of the trainees will influence the effectiveness of various training activities and the outcomes of a training program. In the evaluation described in part one, trainees were asked to comment on the training program and evaluate the pace of instruction, training materials, and instructional strategies. Also, pre and post-tests results were coded so that only the trainee would know his/her score.

Other factors that will influence the design are the type of competencies being developed, the resources available at the training site, length of the training program, and the expertise available to conduct the evaluation. The quality training program evaluation described earlier, focused on the development of cognitive skills that could be evaluated with a paper and pencil test. Many training programs will include competencies that require performance tests. Most, if not all, of these competencies need to be evaluated with a performance test. In other words, the trainee must demonstrate the ability to do the task.

Resources available at the training site will have an impact on the success of the training program. The impacts of these resources need to be evaluated and their adequacy determined. For example, in the training program described in the initial part of this paper, sufficient computer terminals were available so that no more than two trainees worked on a terminal. In the first program, the plant site provided the terminals and the result was five or six different types of terminals. The instructors and trainees suggested that only one type of terminal and one with paper output be used.

Length of the training program may have an influence on the evaluation design. Longer training programs should include interim evaluation activities with feedback to trainees and trainers.

The expertise available to conduct and interpret the evaluation activities must be considered. Scheduling a sophisticated performance test will not be appropriate if the personnel available do not know how to administer it. Also, the users of the evaluation results must be able to understand them and use the data in making decision.

Comparison and Control Groups.

Usually one would like to have a comparison or control group to use in analyzing the evaluation data from a training program. A control group helps the evaluator isolate the impacts of the training program from the trainee changes that take place as the result of other events and experiences.

Often it is difficult to obtain a true control group for an evaluation. However, one may be able to acquire a comparison group that is similar. For instance, another department with a similar mix of employees could be utilized. If the training program is going to be conducted for several departments, one or more of the departments waiting for the program could serve as a comparison group. When this type of design is used, pre and post-tests need to be administered.

If control or comparison groups are not available, a time series design using job performance that could be used. For example, if an SPC training program is conducted to reduce the number of defective products produced, the impacts of this program could be evaluated by comparing the proportion of defective items produced before and after the training program. A time series design typically includes a baseline of data for several days or weeks prior to the training program. Performance levels after the training program are compared to this baseline. Often the baseline is available through control charts, pareto diagrams, or process capability data. Thus, it does not require much additional data collection. One caution needs to be mentioned; however, the time series data will reflect all changes, events and training programs that take place during the time period studied. The impacts of a training program may be masked or enhanced by the impacts of other events.

Whenever possible, a pre and post-test design should be used. This allows the evaluator to determine if the trainees have significantly improved their knowledge and performance levels. Administering a test or evaluation at the end of a training program gives a snapshot of the trainees' competency at that point in time. It does not indicate the changes that may have occurred.

Use A Follow-Up Study.

One of the most powerful techniques available for evaluating training programs is a follow-up assessment of the trainee's performance. This can be done by collecting and analyzing data on individual trainee's performance or on the performance of a group. When possible, natural or typical data collected on processes and products should be used. Quality data can be analyzed to determine if non-conforming parts or services decrease and if productivity increases. An effective Cost Of Quality (COQ) program should provide much useful data. Pareto and Cause-Effect diagrams can be reviewed to ascertain if common errors and problems have been reduced.

A short-term follow-up completed in the three months after a training program will determine the immediate effects of a training program. It can also identify any constraints the trainees are encountering as they try to use new competencies and procedures. A long-term follow-up study done nine to eighteen months after a training program will identify the long-term effects of a training program.

A word of caution is appropriate at this point. The longer the time span between the training program and the follow-up evaluation, the greater the possibility that other factors may have had an impact on the trainees' performance. They may have participated in additional training programs, new equipment may have been installed, and/or suppliers may have improved their performance. Hence, it is important to review the trainee competencies assessed in the follow-up and determine the other factors that may influence performance. In general, it will be easier to track the impacts of a training program on specific technical competencies and knowledges than the impacts of more general training and educational programs.

CIPP Design.

One of the tools I have found very useful in designing evaluations is the CIPP Evaluation Model. The letters in CIPP represent Context, Input, Processes, and Products respectively. The model is based on the systems concept. (See Figure 4)

The starting point in applying the CIPP model is to clearly identify the purpose of the training program. Clear and descriptive training objectives are needed to accomplish this. These objectives will allow the evaluator to specify the trainee competencies that need to be measured (Products).

After these competencies have been listed, the relevant input competencies of the trainees can be specified. The input competencies will be the same as the output competencies, but may include some skills and knowledge that are used in the product. A pre-test is used to assess the input side. A post-test will be given to assess the product(s).

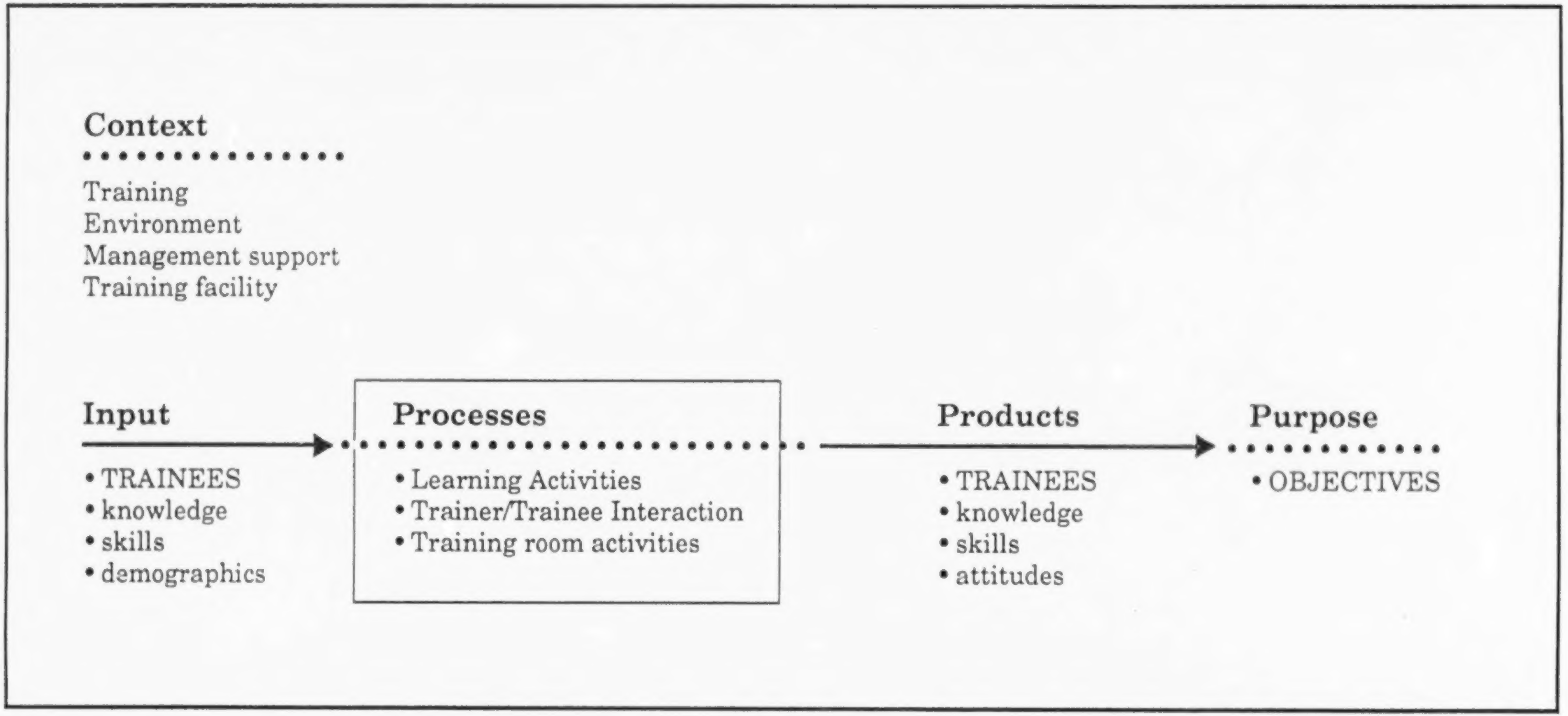
The nature of the product and the inputs can be used to specify the types of process and context data needed. The processes will change the input to product. In this realm, the evaluator should focus on the adequacy and effectiveness of the training activities. The evaluator should consider observing training sessions and asking for feedback from instructors and trainees.

Context is a more general variable. It includes the training facility, resources and environment. Again, the evaluator would want to use the product to help identify the context factors to be evaluated. For example, in the quality training program, one of the training objectives was to develop the ability to use MINITAB. This required access to MINITAB, a terminal and related instructional materials. Through the evaluation it was found that using one type of terminal made it easier to teach. Trainees also recommended that it was easier for them to use a terminal that had paper output. This change was made and the instructors found that it was simpler to teach and the trainees had fewer problems with the terminals.

Summary

An effective evaluation is designed to measure attainment of the training program objectives. the evaluation must also provide data that is useful to the participants in the training process. Situational factors must be considered as the design is developed. Characteristics of the trainees, instructional setting and training materials have to be weighed as the design is developed. Some type of control or comparison group is needed to completely assess the impacts of a training program. Adding a follow-up study to an evaluation is an effective way to identify the impacts of the training program on trainees' on-the-job performance. Application of the CIPP evaluation model will provide direction for the evaluation design process.

Figure 4: CIPP Model Applied to a Training Program



Context

Training
Environment
Management support
Training facility

Input

- TRAINEES
- knowledge
- skills
- demographics

Processes

- Learning Activities
- Trainer/Trainee Interaction
- Training room activities

Products

- TRAINEES
- knowledge
- skills
- attitudes

Purpose

- OBJECTIVES

APPENDIX D

Statistics and Control Program

Evaluation Form

Statistics and Control Program

Evaluation Form

DIRECTIONS: Respond to each of the following statements based on your experences in this training program. Use the following responses.

1 = SD = Strongly Disagree
2 = D = Disagree
3 = U = Undecided
4 = A = Agree
5 = SA = Strongly Agree

	Characteristics of the Training Program	Responses SD 1	 D 2	 U 3	 A 4	 SA 5
1.	This program was worthwhile	1	2	3	4	5
2.	I enjoyed using MINITAB	1	2	3	4	5
3.	MINITAB can be helpful in my work	1	2	3	4	5
4.	I gained a better understanding of statistics	1	2	3	4	5
5.	I will be able to use the contents of this training program	1	2	3	4	5
6.	I liked the opportunity to work with my own data	1	2	3	4	5
7.	There should be more opportunity to apply the contents to practical problems related to my work	1	2	3	4	5
8.	I knew most of the content of this training program before we started the sessions	1	2	3	4	5
9.	I learned a lot	1	2	3	4	5
10.	The instructors' explanations were clear	1	2	3	4	5
11.	The instructors effectively answered questions	1	2	3	4	5
12.	The instructors were able to relate the content of this training program to practical problems	1	2	3	4	5
13.	The instructors were well prepared	1	2	3	4	5
14.	I plan to use some of the techniques presented	1	2	3	4	5
15.	Too many topics were included in the program	1	2	3	4	5
16.	Too few topics were included in the program	1	2	3	4	5
17.	The visuals used were helpful	1	2	3	4	5

BEST COPY AVAILABLE

18. The handouts were helpful 1 2 3 4 5

19. How could the training program be improved?

0. What did you like best about the training program?

HIGH-TECHNOLOGY TRAINING MODEL

WORK BASED LEARNING EXPERIENCES

Developed as a part of the High-Technology Training Model for Rural Based Business and Industry, Technical Colleges and Local and State Educational Agencies under Grant No. V199A90151

Prepared by:
Kathleen Hirsch, Howard D. Lee, and J. Timothy Mero
Center for Vocational, Technical and
Adult Education, University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 398
Purpose 398
Objectives. 398
Value of Work Based Learning Experience 398
Cooperative Occupational Education (Co-op). 403
Internship. 403
Work Experience 403
Outcomes for Work Experience. 404
Evaluation. 405
References. 406

Appendices

A. Training Plan 407
B. Training Agreement. 410
C. Student's Program Evaluation Form 414
D. Instructor's Student Evaluation Form. 417
E. Business's/Industries Program Evaluation Form 419

LIST OF FIGURES

Figure 1. Comparison of Three Plans Using the Work Environment 402

Work Based Learning Experience

Introduction

There is no single approach to education which will satisfy the individual needs of each and every student. For an educational experience to hold the interest of the student, it should be perceived as being meaningful and attainable. Work based learning provides an alternative means of allowing students to internalize the value of their education experience.

Purpose of this Module

The purpose of this module is to describe selected forms of work base learning experiences which can be used as alternative educational models.

Objectives

The objectives of this module are to:

1. Provide a general description of several forms of work based learning which include field trip, career education, simulation, job shadowing, mentoring, co-op, internship, and general work experience.
2. Provide general information and example forms pertaining to the development, administration and evaluation of a work based learning experience program.

Value of Work Based Learning Experience

Work based learning allows the student to develop work habits, skills and attitude, and provides exposure to the tools, equipment, materials, and work problems encountered in a real business and industry situation. Additionally, work based learning should pull basic skills together to solve business and industry problems.

General Objectives of a Work Based Learning Program

The following general objectives have been identified for work based learning:

1. Enhance the development of positive work habits, attitudes, and general employability skills for participating students.
2. Provide participating students with a work based experiences requiring the practical application of oral communications, reasoning, problem solving, and basic skills.
3. Provide exposure to up-to-date equipment and technology at a reasonable cost.
4. Provide an understanding of the relationship between education and work.
5. Identify work roles requirements and future educational opportunities appropriate for the abilities, desires, and interests of students.

Forms of Work Base Learning

Work based learning may take several forms which include; field trip, career education, simulation, job shadowing, mentoring, co-op, internship, and general work experience.

General Description of Work Based Learning Experiences

The following are brief descriptions of forms of work based learning programs which provide students with an opportunity to apply their formal educational experience in a work based experience.

Field Trip

A field trip provides an opportunity to visit actual workplace sites. Students can explore many types of work and identify the skills and training necessary for specific work. A field trip can increase the awareness of the role work plays within society and can be beneficial in determining a future career decision. Upon completion of the field trip, this experience should be evaluated by the teacher and students to see if the goals were met.

Career Education

Career education is another concept that exposes students to the skills and knowledge needed for exploring, understanding, and performing various life roles. Career education experiences often include linkages between earning and learning. It provides students with experiences designed to increase self-awareness, career awareness, and career decision-making. The Wisconsin Developmental Guidance Program Curriculum Guide published by the Department of Public Instruction contains educational activities with instruction to assist students in personal, social, career, and learning development. Components of this guide could provide ideas for work based learning experiences.

Simulation

Simulation provides students with short term experiences over a period of several weeks. The student gains awareness of the many tasks involved within a job. It provides a student with an opportunity to explore business, possible jobs, and enhance their career development.

Job Shadowing

Job shadowing provides an opportunity to spend a day, or part of a day, on the job with a person who works in an occupation in which the student has an interest. The student trails the volunteer business professional around to understand the routine and requirements of the job. Information is provided by the business volunteer as to educational requirements, expected salary/benefits, and other options in that occupational field.

Mentoring

Mentoring is another form of a work based learning experience. The instructor obtains an experienced person in an occupational area to serve as a role model (or a career advisor) and assists in further developing student career exploration experiences. People serving as mentors are usually volunteers and provide a one-to-one relationship.

Cooperative Occupational Education (Co-op), Internship, and Work Experience

Cooperative Occupational Education, Internships, and general work experience are directly worker based programs. Figure one shows a comparison between co-op, internship and general work experience.

Figure 1. Comparison of Three Plans Using the Work Environment

Characteristics	Co-op	Internship	Work Experience
Student identifies career objective	Yes	Sometimes yes	No
Related classroom instruction	Yes	Not necessarily	No
Established training station and supervision by the school	Yes	Not usually	No
On-the-job training plan	Yes	No	No
Paid employment	Yes	Yes	Not necessarily
Uses advisory committee	Yes	No	No
VSO correlated with instruction	Yes	No	No
Certified teacher in occupational area	Yes	No	No
Planned home visitations	Yes	No	No

Source: Ralph E. Mason, "The Effective Use of Cooperative Work Experience," Business Education Forum, Vol. 24, May 1970, p.10.

Cooperative Occupational Education (Co-op)

Co-ops use the occupational goals which are based on the student's career objective as the basis for this learning experience. The work situation could be a simulated laboratory that could be found in a classroom setting or a selected training station. The work situation is correlated with classroom instruction. The student usually receives pay as well as credit. There is supervision provided by the school instructor and work site host. This experience typically lasts one year.

Internship

In this situation, the student performs in an approved job situation. The student is usually paid and is given credit for this experience. In-school instruction is usually provided before the student begins the internship and may not necessarily be tied in directly with the job experience. This experience typically lasts one semester but can go two. In a secondary setting, this experience is referred to as work-study and on a postsecondary setting can be referred to as practicum or internship.

Work Experience

Work experience is a set of planned educational experiences which is design to enable students to acquire attitudes, skills, and knowledge of work through studying and observing. This type of experience is exploratory in nature and is usually accomplished in one semester or less. Usually there is no specific related class but rather work experience is found woven throughout a curriculum.

Outcomes for Work Experience

The basic outcome of work experience is a general understanding of the world of work and the development of acceptable work habits, attitudes, and personality traits. A student may learn some skills and information relevant to a particular occupation or job, but this is not the main purpose.

The primary outcome is to help students develop those abilities, habits, and characteristics that are of value for any job. This experience provides the opportunity for career explorations and development of career interests.

Training plans and agreements become part of these types of work based learning experiences. A training plan states the specific learning experiences which are to be offered based on the student's career goal. The purpose of the training plan is to organize learning and to correlate the classroom instruction with learning experiences at the actual work site. It is usually organized in a logical sequence and is based upon competencies needed for successful employment.

A training agreement is a written agreement of the training commitment of the employer to the student. The purpose of a work based learning program is to give the student experience in a variety of tasks. The supervisor should sign this agreement before the start of the experience to prevent any misunderstandings about the program. Sample training plans and agreement can be found in Appendices A and B respectively.

Evaluation

The use of evaluation forms is one way of checking on the progress students are making in adjusting to and learning about work based learning experiences. Students gain insight into their progress which helps to identify their strengths and weaknesses. The evaluation form should be appropriate for the grade level of the student and the type of experience they have been given. Forms should be reviewed periodically to determine their appropriateness and the need for possible revision. As a general rule, the fewer the forms the better. Examples of student, instructor and business/industry evaluations are provided in Appendices C through E.

References

Carnelvale, Anthony P. Workplace Basics: The Skills Employers Want, U.S. Department of Labor Employment and Training Administration and the American Society for Training and Development, U.S. Department of Labor, Washington, D.C.

Kimbrell, Grady. Strategies for Implementing Work Experience Programs, McKnight Publishing Company, Bloomington, IL, 1975.

Mason, Ralph E., Lorraine T. Furtado and Stewart W. Husted. Cooperative Occupational Education and Work Experience in the Curriculum, The Interstate Printers and Publishers, Inc., Danville, IL, 1989.

Wisconsin Department of Industry, Labor and Human Relations, Equal Rights Division, Labor Standards Bureau, Madison, WI.

Wisconsin Department of Public Instruction. Education for Employment, A Resource and Planning Guide, Bulletin No. 9160, 1988, Work Experience Coordinator's Handbook, Bulletin No. 2425, August, 1981, Work Experience Handbook, Bulletin No. 6423, 1986.

APPENDIX A
Training Plan

TRAINING PLAN

Student____________________________Training Station____________________

Supervisor_________________________

Title______________________________

This training plan is an agreement between the employer/training sponsor and the coordinating teacher. The job supervisor trains the student-trainee for specific tasks on the job and provides as many different learning experiences as possible throughout the year.

The school will provide the student with opportunities for training in the basic skills of the occupations and the technical information related to it. In order that a systematic plan can be followed which will provide well-rounded training for the position, a schedule of planned work experiences have been worked out.

The student-trainee agrees to perform the work experiences assigned by the job supervisor according to the same company policies and regulations as apply to regular employees. The student-trainee also agrees to pursue the prescribed course of study and to take advantage of every opportunity to improve efficiency, knowledge, and personal traits so that he/she may enter any occupation as desirable employee.

The parent or guardian's signature indicates consent for the student-trainee to work and to study through the Work Experience Program. The job supervisor recognizes that the Work Experience Program prepares students with employability skills.

Progress and advancement made by the student-trainee will be evaluated by the job supervisor each semester. The coordinator will cooperate with the training sponsor in an effort to plan classroom instruction in accordance with the work experience schedule. Training will cover the ______ school year for a minimum of 15 hours per week.

________________________ (Parent or Guardian)	________________________ (Job Supervisor)
________________________ (Student-trainee)	________________________ (Coordinating Teacher)

TRAINING PLAN

Time Period____________________ Job Title______________

Title__________________________

Trainee________________________ Supervisor_____________

Job Task Rating Scale

1. Can perform task satisfactorily without supervision.
2. Can perform task with supervision - needs additional work.
3. Cannot perform task satisfactorily.
4. Has not experienced job task.

		Job Task Rating
	Job Tasks to Perform	1 2 3 4
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________
______	______________________________	______________________

4.0

APPENDIX B

Training Agreement

TRAINING AGREEMENT
_______________High School
Department of Public Instruction
Wisconsin Department of Industry, Labor and Human Relations

Name of student-trainee:____

Name of Firm:____

Address of Firm:____

School:____

Occupational Title:____

The employer agrees to cooperate with the school(s) to offer a varied program. The employer agrees to pay the student-trainee a beginner's wage of $_____ per hour, furnish ratings of the student's on-the-job performance, and confer with the coordinating teacher periodically to determine in what way the student's learning in school and on the job might be strengthened. (If a sub-minimum wage is issued, the school must show acceptance by the Wisconsin Department of Industry, Labor and Human Relations and the U.S. Department of Labor when applicable.)

The student-trainee agrees to perform to the best of their ability all duties assigned and conform to all rules and policies of their place of employment and the school. Student-trainees expect no special privileges, agrees to be on the job every day (barring illness), and will confer with their coordinating teacher regarding any problems encountered on the job.

The parent or guardian agrees to cooperate with the school and employer to insure the best possible results from the student's training.

The work schedule will be from ______ to ______, Monday through Friday, from ______, 19___, to ______, 19___. In general, students should average a minimum of ten hours of work per week, not including Saturdays and school holidays. This average may spread over an entire school semester or year. The student should not exceed 40 hours per week of school and work experience (total hours in class on the job) Monday - Friday.

THIS TRAINING AGREEMENT DOES NOT SUPPLEMENT THE WORK PERMIT. EMPLOYERS MUST BE ISSUED A WORK PERMIT FOR THE STUDENT BEFORE A STUDENT STARTS OCCUPATIONAL TRAINING.

____________________________ (Student-Trainee's Signature)	____________________________ (Employer's Signature)
____________________________ (Address)	____________________________ (Coordinating Teacher's Sign.)
____________________________ (Parent's Signature)	____________________________ (Administrator's Signature)
____________________________ (Address)	____________________________ (Date)
____________________________ (Telephone Number)	

THE STUDENT-TRAINEE WILL:

1. Report promptly and engage in their assignment according to the training schedule.

2. Cooperate with the agency supervisor, engage in the assignment as a training experience, observe etiquette, and keep safety rules.

3. Notify the school and agency in advance when absence is unavoidable.

4. Maintain satisfactory grades in all subjects in order to remain eligible for the program.

5. Furnish the coordinating teacher with all necessary information and complete all necessary reports.

6. Show honesty, punctuality, courtesy, a cooperative attitude, proper health and grooming habits, appropriate dress, and a willingness to learn.

7. Remain with the employer during the training period.

8. Abide by the rules and regulations of the cooperating agency.

9. Keep all business information of the cooperating agency confidential.

THE COOPERATING AGENCY WILL:

1. Provide a training program, with varied experiences, which will contribute to the education of the student.

2. Provide a job sponsor for the training of the student.

3. Provide employment for the student during the agreed times.

4. Adhere to all Federal and State regulations.

5. Provide for the day-to-day safety of the student on-the-job.

THE PARENT OR GUARDIAN WILL:

1. Be responsible for the conduct of the student while participating in the program.

2. Be responsible for the method of transportation and for the student in delivery to and from their place of employment.

3. Provide time for conferences with the coordinating teacher.

413

4. Become knowledgeable concerning the purposes and procedures of the training program.

THE COORDINATING TEACHER WILL:

1. Visit and assist the employer with establishing the training program.
2. Observe the student on the job intermittently.
3. Cooperate with the employer with the evaluation of the student. Final evaluation is the prerogative of the school.
4. Make every attempt to solve problems that may arise from the cooperating agency, school, parent/guardian, student, or community.
5. Provide meaningful in-school instruction related to the training activities of the student.
6. Work with a local advisory committee to obtain assistance with the program.
7. Provide general safety instructions to assist student.
8. Cooperate with the employer in further safety training.

The employer will comply with the provisions of Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and Title VI of the Civil Rights Act of 1964 by not discriminating on the basis of sex, handicap, race, color, or national origin in its treatment and assignment of students to jobs, hours of employment, levels of responsibility, and pay.

APPENDIX C

Student's Program Evaluation Form

Student's Evaluation Form

How has the experience you received been valuable to you?

____

____

____

Could the training on-the-job be improved? _______ If so, how?

____

____

Was the instruction you received in school related to the work you were doing on the job?

____

____

____

Can you make any suggestions which you feel would improve the classroom instruction?

____

____

____

What parts of the classroom instruction did you find most beneficial? (discussions, reports, interviews, demonstrations, etc.)?____

____

____

In general, how adequate was your work based learning experience for preparation in the following situations or life skills: (Please circle number 5, 4, 3, 2, or 1 for each statement.)

	More Than Adequate		Adequate		Not Adequate
Learning a specific job skills . . .	5	4	3	2	1
Learning a specific job knowledge . .	5	4	3	2	1
Getting along with other workers . .	5	4	3	2	1
Being able to talk to the boss about your problems	5	4	3	2	1
Understanding the value and importance of work	5	4	3	2	1
Solving problems on the job	5	4	3	2	1
Understanding the U.S. and world economic systems (supply-demand, inflation, recession, etc.)	5	4	3	2	1
Managing career responsibilities with home and family responsibilities. . .	5	4	3	2	1
Applying basic skill preparation in math, reading, writing, spelling, speaking, listening to every day problems	5	4	3	2	1

Please make any suggestions you have for improving the program.

APPENDIX D

Instructor's Student Evaluation Form

Evaluation by Instructor

Student's Name____

Please rate the following statements by placing an "X" in the appropriate space.

Excellent = A; Above Average = B; Average = C; Poor = D. An "F" shows failure to meet minimum standards. Not Applicable=N/A.

Characteristic	A	B	C	D	F	N/A
Demonstrates willingness to learn						
Exhibits acceptable personal growing						
Reports to work on time						
Applies self to the job						
Adapts to new situations						
Initiates work without supervision						
Completes the job satisfactorily						
Possesses emotional stability						
Shows self confidence						
Follows directions						
Accepts criticism						
Exhibits ability to work with others						
Works safely						
Works above the beyond demands						

Note: It is suggested that students be evaluated every four weeks so they will have an opportunity to improve. It may be good procedure to ask students to first evaluate themselves. It is very important to sit down with students and discuss the evaluation once it has been completed. Remember, positive feedback and strategies for improving are an important part of the evaluation.

APPENDIX E

Business's/Industries' Program Evaluation Form

Business's and Industry's Student Evaluation

1. Do you feel the student was placed in a program that best suited their interests and abilities?

2. Do you feel the student lacked preparation for the on-the-job training position?

Please rate the student in the following areas: (Circle the appropriate responses)

	Well Prepared		Adequately Prepared	Not at all Prepared	
	(5)	(4)	(3)	(2)	(1)
3. Occupational knowledge .	5	4	3	2	1
4. Occupational skills . .	5	4	3	2	1
5. Work attitude	5	4	3	2	1
6. Work quality	5	4	3	2	1
7. Work quantity (amount produced).	5	4	3	2	1

8. Was the teacher/coordinator's supervision of the student adequate and helpful?
Explain.______________________________

9. Was there cooperative effort on the part of the teacher/coordinator and training supervisor in developing individual related classroom instruction to benefit the student's on-the-job training? ______ If yes, was it effective?

In the following areas of basic skills, how well prepared was this student? (Circle the appropriate responses)

		Well Prepared (5)	(4)	Adequately Prepared (3)	(2)	Not at all Prepared (1)	Not Observed (0)
10.	Reading	5	4	3	2	1	0
11.	Spelling . . .	5	4	3	2	1	0
12.	Computer Literacy	5	4	3	2	1	0
13.	Math	5	4	3	2	1	0
14.	Science	5	4	3	2	1	0
15.	Writing	5	4	3	2	1	0
16.	Speaking . . .	5	4	3	2	1	0
17.	Listening . . .	5	4	3	2	1	0
18.	Problem Solving	5	4	3	2	1	0

19. To what degree did the student develop the proper attitudes and work habits?

____

____

Please rate the student on each of the characteristics listed below. (Circle the appropriate responses)

		Has Grown (5)	(4)	Made Improvement (3)	(2)	Needs Improvement (1)	Not Observed (0)
20.	Use of tools and equipment . . .	5	4	3	2	1	0
21.	Selection and care of space, materials, and supplies . .	5	4	3	2	1	0
22.	Ability to work with co-workers . . .	5	4	3	2	1	0
23.	Accepting advice and supervision . .	5	4	3	2	1	0

	Has Grown		Made Improvement		Needs Improvement	Not Observed
	(5)	(4)	(3)	(2)	(1)	(0)
24. Working in a leadership role when applicable . . .	5	4	3	2	1	0
25. Understanding the value and importance of work	5	4	3	2	1	0
26. Prompt and dependable in attendance .	5	4	3	2	1	0
27. Willing to accept and perform tasks .	5	4	3	2	1	0
28. Ability to plan and direct own work	5	4	3	2	1	0
29. Ability to make sound decisions . . .	5	4	3	2	1	0
30. Shows consideration and kindness towards others	5	4	3	2	1	0
31. Neat, clean, and appropriate appearance . . .	5	4	3	2	1	0
32. Flexibility to accept change	5	4	3	2	1	0
33. Ability to learn new job tasks . . .	5	4	3	2	1	0

34. Please make any comments or suggestions that would improve the program.____

____

____

____

____

____

HIGH-TECHNOLOGY TRAINING
MODEL MODULE

Developing Partnerships Between
Education and Business/Industry

Developed as a part of the High-Technology
Training Model for Rural Based Business and
Industry, Technical Colleges and Local and State
Educational Agencies under Grant No. V199A90151.

Prepared by:
John Entorf
University of Wisconsin-Stout
Menomonie, WI 54751

TABLE OF CONTENTS

Introduction. 425
Purpose 425
Objectives. 426
Developing Partnerships 426
Interaction/Projects. 430
Maintaining A Partnership .431
Benefits of Continued Interaction 432
Summary 433

Appendix

A. Model for Developing Education and Business/Industry Partnership. 435

Developing Partnerships Between Education and Business/Industry

Introduction

In today's intensely competitive global economy, partnerships between educational institutions and the business/industrial sector can yield many important benefits to both parties. The educational process is enhanced by involving students in real-world problems and by gaining access to state of the art equipment and leading edge technical expertise. Industry gains access to specialized technical expertise, research capabilities and future employees.

When attempting to establish such partnerships, the primary function of both parties to the partnership must be kept firmly in mind. Educational institutions have a primary mission to teach (research and public service are secondary goals) and industry is in business to produce the best products at the lowest price.

From an educational point of view, the real value of participating in a partnerships with businesses/industries lies in their potential to improve the educational process through faculty development and by allowing students to participate in realistic experiences. If these considerations can be satisfied, such partnerships are of immense value.

Purpose

The purpose of this module is to provide on overview of the considerations and benefits associated with developing and maintaining partnerships involving educational institution and representatives from businesses and industries.

Objectives

The objectives of this module are to:

1. Describe the considerations associated with developing partnerships involving educational institutions and representatives from businesses/industries.
2. Provide information concerning the value to both parties for maintaining a successful partnership.
3. Describe the benefits of continued, long-term interaction.

Developing Partnerships

Developing connections with the outside world can be a daunting task for educational institutions who have little prior experience with outreach. Appendix A graphically portrays the benefits of educational and business/industrial interaction and the relationships that need to be developed for a successful partnership.

Culture

Partnerships can be developed in many ways. To be successful, however, both parties to the partnership must view the potential interaction as a desirable and profitable venture, and both partners must be willing to commit resources to the venture. In short, a culture that values and promotes interaction must exist within both of the participating organizations. If it does not already exist, developing this intra organizational culture will be the first, and perhaps the most difficult task to be addressed. Educational institutions may find that developing this culture is a slow process, as many faculty feel their primary task is to teach, not interact with industry. With patience and perseverance, the value of interaction to the instructional process can be amply demonstrated for most faculty. Once developed, the appropriate culture should be reasonably easy to maintain.

Building Bridges

In parallel with developing an intra organizational culture that favors interaction, bridges to the outside world must be developed. That is, the educational institution's presence, capabilities, and willingness to interact must be made known to industry. One of the best ways to accomplish this is with the assistance of industrialists who see the advantages of interaction.

The University of Wisconsin-Stout has a formal mechanism called the Business and Industrial Professor Program. In this program, Industrialists who have retired or who are about to retire are formally engaged to assist the institution by having them sign a formal contract, usually at no salary. The Business and Industrial Professor enjoys all of the rights and privileges of a tenured faculty member (including 'hunting' for parking spots). They may volunteer or be engaged as staff to teach class, conduct research, assist outreach projects or perform other duties. Their greatest value lies in their contacts with the industrial community and their ability to connect the institution with the right 'people' in industry.

Operational Policy

Successful partnerships are best developed and sustained when there are clear guidelines for interaction, preferably a formal institutional policy that prescribes how certain issues are to be resolved, such as: indirect costs, patent ownership, publication, confidentiality, etc. Another issue of great interest to industry is meeting deadlines--can the project be completed on time at the stated cost? Education on the other hand, has greater concern for enhancing the instructional process, rather than meeting the deadline. Given time and commitment, these issues can be resolved.

Mechanisms

Making connections with potential partners can occur in a variety of ways. Some mechanisms for making connections or identifying potential partners are as follows:

1. Networking. Institutional faculty attend workshops, seminars, conventions, professional society meetings, etc., and develop a network of connections.
2. Advisory committees. Membership on advisory committees can be thoroughly introduced to the strengths of the institution and the potential for interaction. A very effective mechanism.
3. Industry Days. The institution hosts business/industry through the invitation of Chambers of Commerce or Industrial Development Corporation. The focus is to introduce the participants to the educational institution's faculty and resources.

4. Campus Visits. Representatives of individual companies are hosted by unit administrators and provided an overview of the institution, its capabilities and interest. This is a time consuming process, but extremely effective.

5. Speaking Engagements. Representatives of the institution should promote it's strengths, goals and successes at every opportunity; speaking at conferences, workshops, economic development meetings, industry groups; or other meetings.

6. Awards Conferences. Recognition of industry and/or educational leaders for their efforts to promote interaction, the profession or other desirable ends. This is an opportunity to showcase the institution's more successful projects.

Principal Contract

While many people may be involved in identifying potential opportunities for interaction, the process of formally establishing connections should be concentrated in one office. There will be fewer opportunities for misunderstandings or misinformation with one source of information, one central point of contact is desirable for everyone. Where the office or contact individual is located is not overly important, the main contact person must have an intimate knowledge of the institution's capabilities and staff expertise. Much will depend upon the contact person being able to conceptualize many different ways in which a technical problem can be addressed and being able to identify staff expertise from across the campus, not just in his/her school or department.

Again, it is important that there be one set of rules for interaction with outside agencies and that everyone is asked to play by the same rules--i.e. no favors for any group! The office that arranges interaction should have the authority to speak on behalf of the university and make commitments relative to some of the issues cited above. This will make it easier to arrange potential interaction.

Interaction/Projects

A part of the process of promoting interaction will be some institutional self analysis to identify strengths and the areas where it wishes to pursue projects. These will need to be identified along with faculty consultants/experts for development of promotional material. Potential projects would then be sought from among the several companies where a relationship has been formed.

Initiating a successful project will require: (a) demonstration of requisite technical expertise and potential to successfully conclude a project, (b) clear identification of the project parameters, (c) expected project outcomes, (d) time frame for completion, (e) specific goals to be achieved, (f) comprehensive budget, and (g) confidentiality and publication considerations.

Continuing a healthy partnership/relationship will depend upon how well the project goals were satisfied, the value the company perceives it received from the project, and any benefit that may accrue from a continuation of the relationship. In many cases, projects may be successfully completed with complete sponsor satisfaction and no expectation of continuation. In other cases, the project may yield more questions than answers and suggest a continuation along specific lines.

Maintaining A Partnership

Successful completion of a project does not mean an end to the partnership. It will be important for the company and the institution to stay in contact even when no formal activity is underway. Maintaining this relationship will require some effort from the institution's leadership and involve such things as: (a) occasional telephone calls, (b) letters or other correspondence, (c) invitations to assist the institution in other projects or in instructional programs, and (d) requests for capital support.

Both the institution and industry have much to gain from continued interaction. The institution may desire added capital equipment, advice or guidance on new technology, assistance in specialized instruction, connections to other industries, programmatic assistance, or other assistance. Industry may need specific advice on a process, aid in securing students to participate in a cooperative educational experience (Co-op) or internship, names of experienced graduates, speakers for workshops, assistance in organizing instruction, and related work. By continuing an informal relationship, trust and respect can be developed between the two organizations that will yield long-term benefits in the form of mutual support and/or additional funded projects.

Benefits of Continued Interaction

The benefits of continued interaction between education and industry can be as varied as the number of established partnerships. While we have already cited numerous specific benefits for both education and business/industry, one of the prime benefits is the potential for networking and developing totally new connections.

For example, an institution may successfully complete a materials-related project for company A and discover later that the company has great needs in the area of statistical process control at the subsidiary plant in another state. Using its expertise in SPC, the institution may initiate instructional programs with the subsidiary. While conducting these instructional programs, contact may be initiated with the subsidiary of a totally different company that results in securing assistance in program development from that company.

Benefits may be slow to emerge. It may take several years for the right project to 'jell.' This may entail getting involved with several divisions of the company or working with the same division on several project proposals before the right one emerges. As a case in point, the University of Wisconsin-Stout has been involved with a major defense contractor for at least eight (8) years with no concrete project work forthcoming. A number of projects involving both low-technology (trailing edge) and high-technology (leading edge) components were proposed with no results. In the meantime, the defense contractor has supplied numerous pieces of obsolete equipment (obsolete to the company but not to the institution), corporate staff have served on several advisory boards and they have committed numerous technical staff to assist the institution. Within the last several months, the company and the institution are again discussing a project that is likely to result in a new production facility and product line being established adjacent to the university. The point is that long-term relationships are mutually beneficial.

Summary

One never knows what will develop from a contact. Whether it is casual or carefully planned, there appears to be a great deal of serendipity involved in making connections. A casual contact with someone on an airplane may yield a long-term project and relationship, while a carefully laid out program with a hometown company may never bear fruit.

Developing a productive and successful outreach program requires proactive and committed individuals from both sides of the partnership who believe in the importance and value of interaction. These are the individuals who seize every opportunity to establish a connection; who promote dialogue between potential collaborators; who rise early and stay up late to write proposals and promote deals; who speak freely, and at every opportunity, on the value of interaction; who continue to prod, push and cajole. Without these champions, little is accomplished. With them endless horizons of opportunity become available.

APPENDIX A

Model for Developing Education and Business/Industry Partnerships

DEVELOPING EDUCATION AND BUSINESS PARTNERSHIPS

Business/Industry

Needs

- Ideas
- Technical Support
- Training
- Short Term Staff
- New Technology
- Research Facilities

Resources

- Real-Time Problems
- Real Laboratory
- Realistic Problems
- Co-op/Intern Stations
- Leading Edge Technology

Interface

Culture…
A focus on outreach.

Bridges…
Building mechanisms for interaction.

Operational Policy…
Established and consistent methods.

Patent Policy…
Formal statement.

Connections…
Methods for establishing connections.

CHAMPIONS !

University/College

Resources

- Faculty/Staff/Students
- Research Facilities
- Technical Labs
- Management Expertise
- Technical Expertise
- Business Expertise

Needs

- Staff Development
- New Skills
- New Technology
- Co-op/Intern Stations
- Real-Time Projects
- Realistic Projects